CANADIAN MACHINERY
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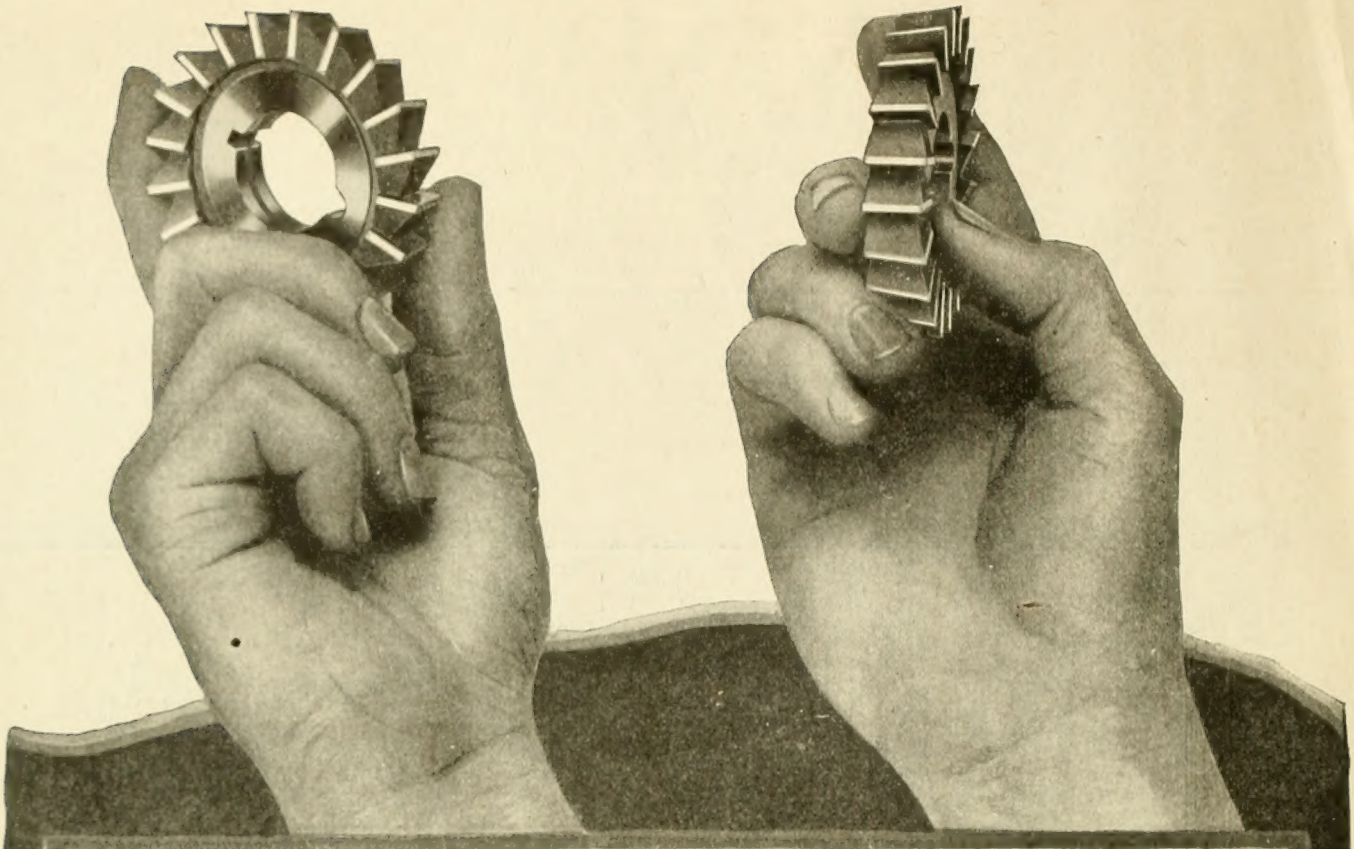

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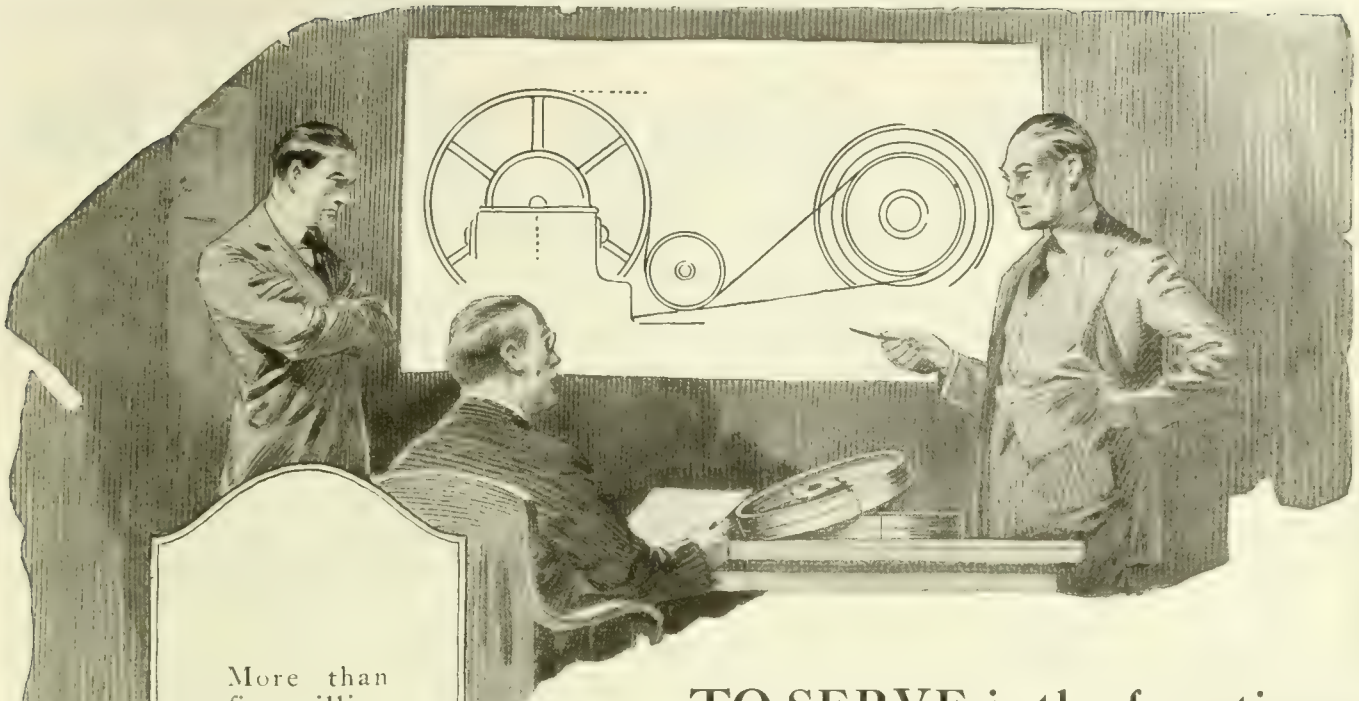

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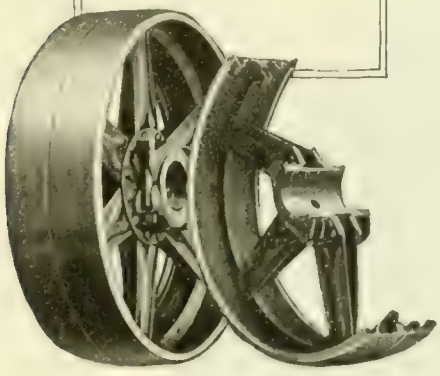

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THE tremendous sale of "American" Pulleys exemplifies the correctness of the principle that he who serves best sells most.

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The value of the American Pulley Engineering Service to you will be particularly emphasized, if you are confronted with an *unusually* difficult driving problem.

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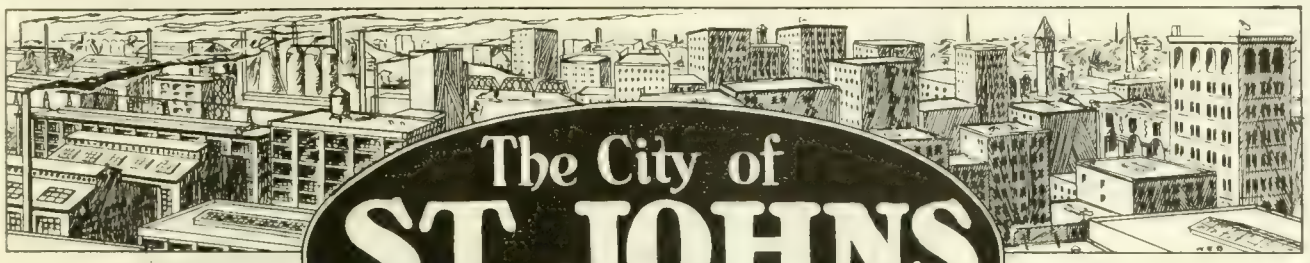

The City of ST. JOHNS QUEBEC

Locate in this Real Transportation Centre

St. Johns is a nerve centre of the network of railways connecting Central and Western Canada with the Maritime Provinces and with the Eastern States. Seven railways, including the C.P.R. and G.T.R., run through the city and are interconnected in the St. Johns yards by a terminal switching company. The manufacturer locating in St. Johns enjoys the advantages of competitive freight rates and dispatch in the assembling of raw materials and distribution of the finished product. The city in fact commands lower freight rates and a cheaper coal supply than any other centrally located manufacturing city on the North American continent.

St. Johns is directly connected by rail with the Montreal docks, 27 miles distant, affording first-class facilities for foreign trade. The city is an ideal location for the American manufacturer opening a branch plant in Canada; having direct connections by water with New York, the St. Lawrence and Great Lakes and the Eastern Seaboard of the United States.

Unlimited electric power is developed at Chambly, eleven miles north-east of the city, and distributed at prices that will compete with any city or town in the Dominion.

Cheap living conditions and low rents and taxes have resulted in cheap labor and an abundant supply of both skilled and unskilled workers is always available. Labor troubles are quite unknown.

In addition to the natural advantages of St. Johns as an industrial site the city also offers extraordinary inducements, such as: Tax exemptions; street extensions; bonus of five per cent. on your payroll for five years, making it an unusual industrial opportunity.

Without a knowledge of your business or the conditions affecting it, we do not claim that St. Johns is rationally your location; but we know that St. Johns possesses extraordinary advantages, that in all probability it is the best site for your plant from every point of view, that you will be running the risk of serious mistake if you do not include this city in your investigations.

Seven railroads, including Canada's great transcontinental lines.
Finest ocean shipping facilities.
Canal connections with New York, the Eastern States, and the Great Lakes.
Cheapest labor market in Canada.
Plentiful supply of skilled and unskilled labor.
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Extraordinary inducements to new industries.

For more specific information write

The Secretary, City Council
ST. JOHNS, QUE., CAN.

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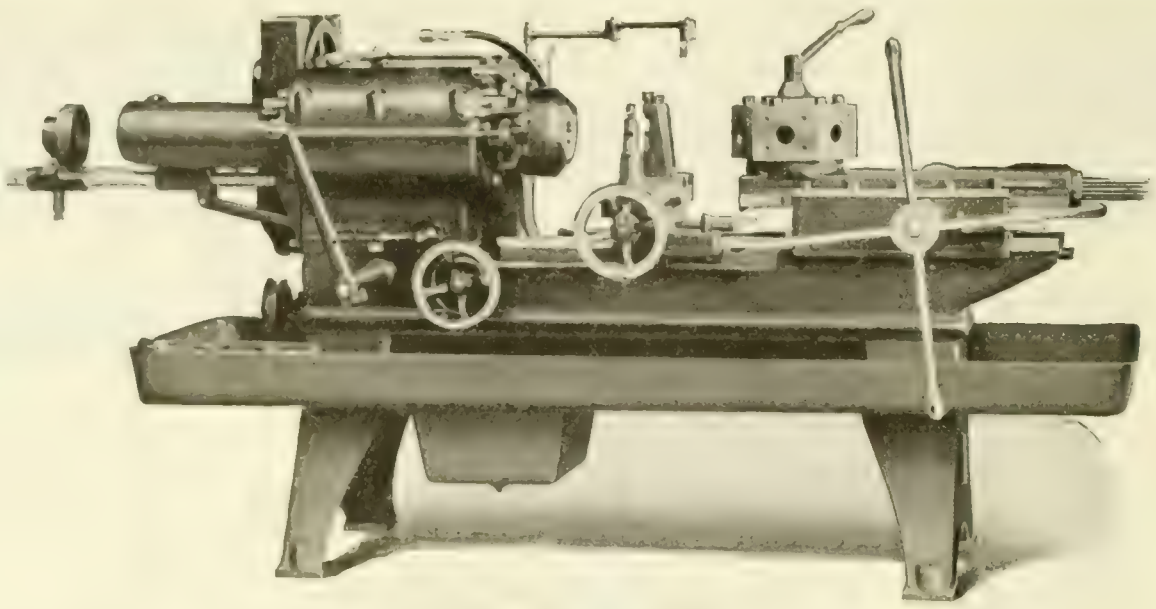

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The New Nos. 4 and 6 Geared Head Turret Lathes

Features:

1—Double the power obtained by cone drive.

2—Double the spindle speeds—twelve through this type head—instead of six using the customary 3 step cone.

3—Motor (constant speed) may be mounted on the head geared direct, or with chain or belt drive to driving shaft.

4—Considerable time saved in changing speeds.

5—All steel gears run in oil bath and lubricate the bearings by splash.

6—With the additions of the heavy duty carriage the No. 6 provides more productive capacity than any similar size machine obtainable to-day.

These turret lathes fill an ever increasing demand for machines to take heavy facing and forming cuts, long drilling operations in the solid—for machining alloy steel gear blanks as well as providing the best solution for direct motor drives.

With their wide diversity of feeds and speeds, these turret lathes are flexible enough to embrace the feeds and speeds ideal for operating on the many different metals in use to-day and for facing, forming and cutting off operations on all diameters within the capacities of the machine.

Capacities	No. 4	No. 6
Swing over bed	16"	20 3/8"
Swing over carriage slide	7"	9 1/4"
Automatic Chuck Capacity	1 1/2"	2 1/4"
Length that can be turned	10"	12"

The Warner & Swasey Company

Cleveland, U.S.A.

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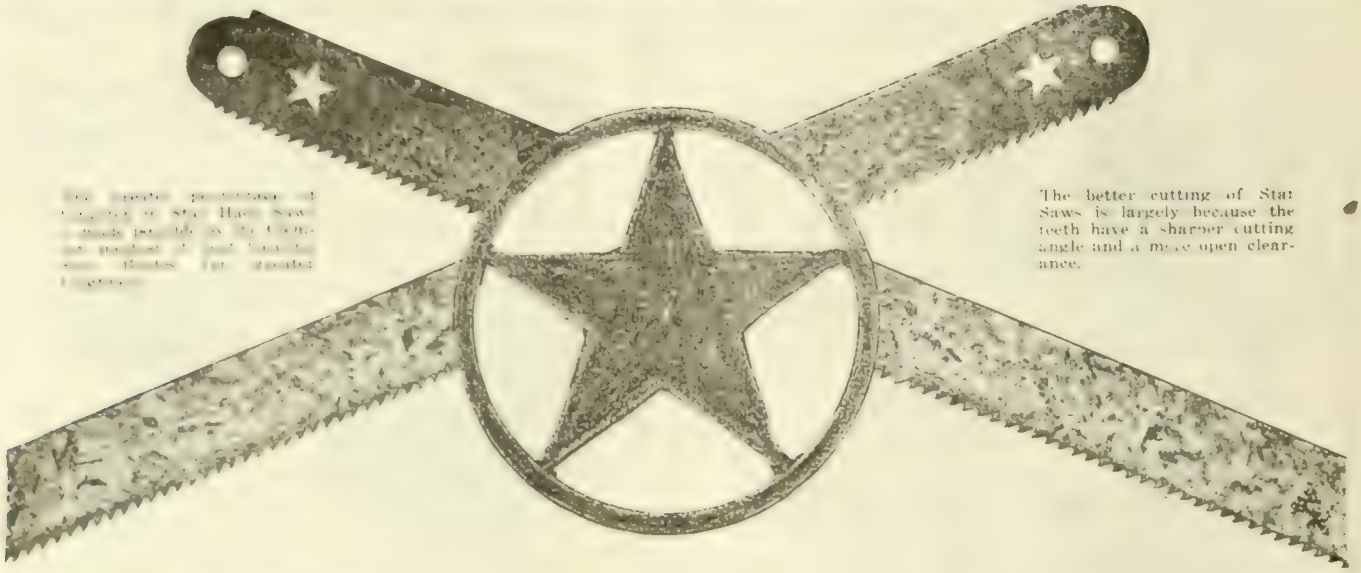

Does It Pay to Order Just
"HACK SAW BLADES?"

Many hack saw users grow careless. They order just "hack saw blades."

Because it has been the standard blade for 35 years, most dealers will fill this order by sending you Star Saws, but —

It doesn't pay to take the chance. You might get fooled some day by receiving an inferior saw blade. It's much safer to specify "Star," every time.

The poorer blade will mean a loss, both in time and material that will amount to much more than the difference in price between Star and ordinary blades.

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Ordinary blades have the old "wood saw" tooth and two-way clearance. Star blades have an undercut tooth and three-way clearance that are made for cutting the hardest metal and do a variety of work that is impossible with ordinary blades.

Star saws prove their better quality very quickly in two ways — they will go through metal that other blades refuse to cut. And one Star blade will cut a far wider variety of sizes, shapes and metals than is possible with ordinary saws.

Make these two tests yourself with Star saws and you will never be satisfied to have other blades used in your shop. Our service men will be glad to help you solve your production problems on Hack Saws if you will write us.

STAR SAWS NOW SOLD BY THE MAKERS

We are not satisfied only to sell our Star Blades but make to render you every service in getting the best results in their use.

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Snapped While on the Job

Heald Style No. 60 Cylinder Grinder.

600-Pound Cylinder as a Test

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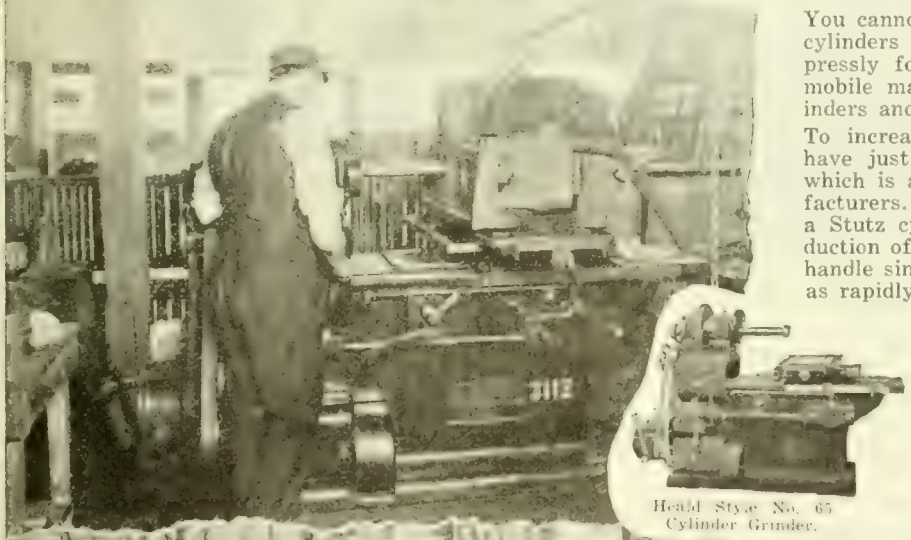
If it is too far to send samples, send prints. We can work from them.



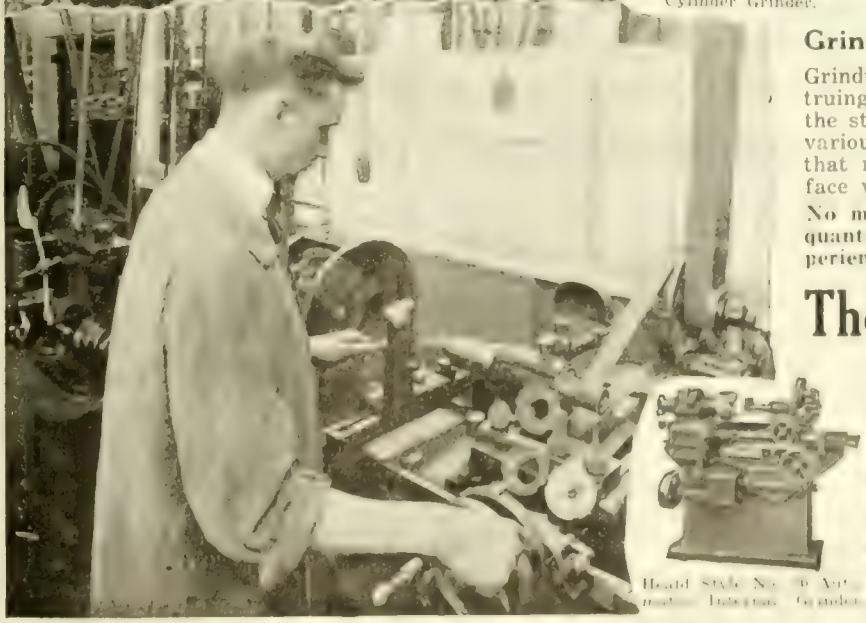
Heald Style No. 65 Cylinder Grinder.

A Manufacturing Proposition

You cannot afford to take chances in reaming cylinders or using any grinder not built expressly for the purpose. 85% of the automobile manufacturers are grinding their cylinders and using Heald machines.

To increase production, the Heald Company have just designed a new cylinder grinder which is a single purpose machine for manufacturers. This Heald No. 65 shown grinding a Stutz cylinder was built primarily for production of massive and heavy work, but it will handle single and two enbloc cylinders equally as rapidly.

Eighty-five per cent. of the motor manufacturers grind. Are you one of them?



Heald Style No. 70 Automatic Internal Grinder.

Grinding Large Radii on Tubing Dies

Grinding tubing dies called into use the radius truing device which can be furnished on either the style No. 70 or No. 75. The dies were of various sizes requiring special shaped wheels that not only had a radius but part of the face was straight.

No matter how odd your work is, send in a quantity of samples or blue prints. Our experience is yours for the asking.

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Our Trade Name for Chrome-Molybdenum Steel

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United Alloy Steel Corporation

Canton
Ohio

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Franklin Die-Castings have played an essential part in this development, and today they fill an important place in the specifications for automobiles and accessories.

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We cast in aluminum, tin, lead and zinc base alloys, and quote from samples or blueprints.

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Gifford and Magnolia Streets, Syracuse, N. Y.

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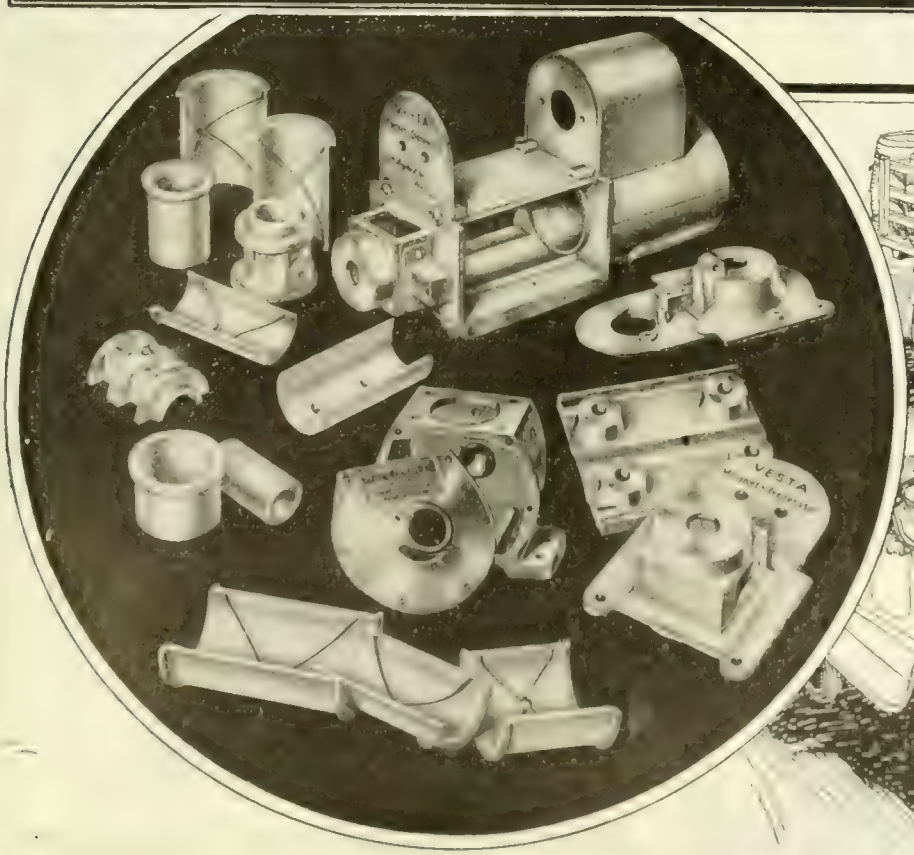
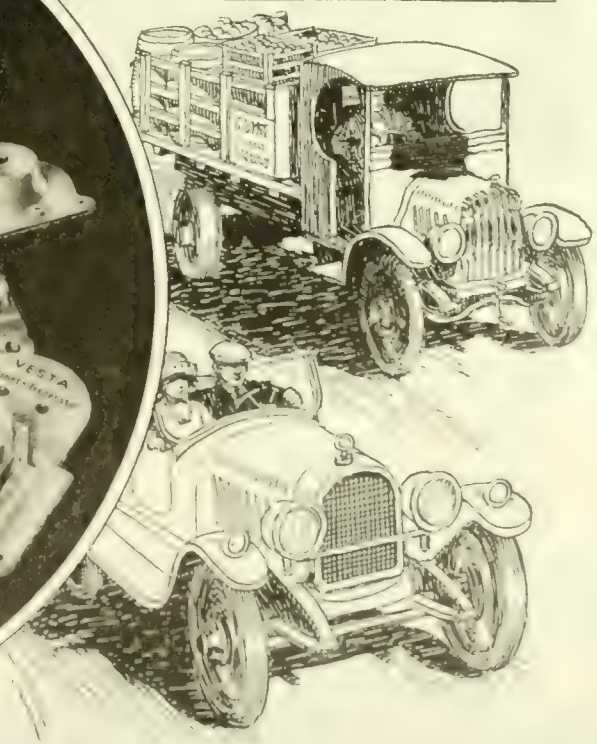
Our booklet, "Franklin Die-Castings in Many Fields," relates in detail some of these accomplishments. Write for it.





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It will pay you to write for catalogues, consult our Buyers' Directory and write where you have listed under proper heading.

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If what you want is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

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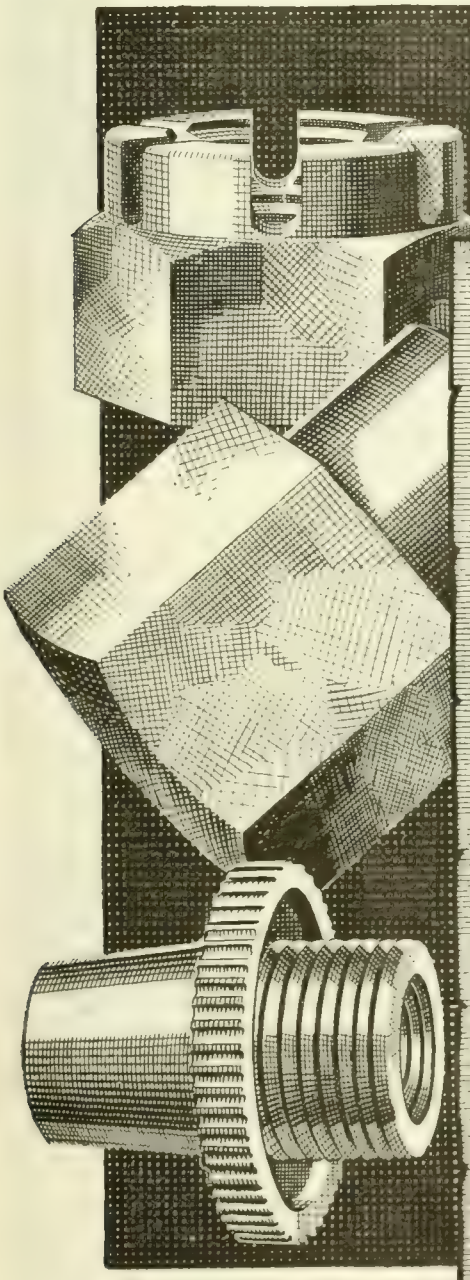

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Screw machine product up to 2¼" diameter to customers' specifications. Hardened and ground product to specifications.

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V., U.S.S., and S.A.E. Cap Screws
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What are your requirements

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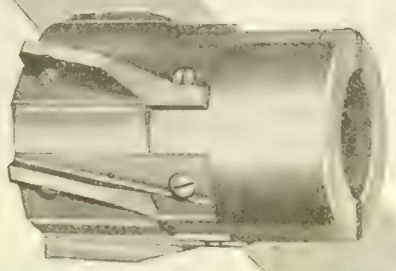
A NEW GISHOLT PRODUCT

The Gisholt MANUFACTURING Reamer

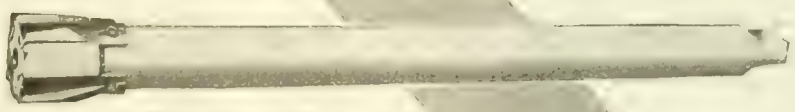
A solid reamer that is adjustable
An adjustable reamer that is solid

A reamer that will stand feeds and speeds much greater than those usually employed in reaming.

A reamer for MANUFACTURING work, that will ream hundreds of smooth, accurate holes without regrinding—holes that will pass inspection immediately—and when dull may be repeatedly adjusted to original size. When original blades are worn out, new ones may be substituted.



Shell Reamer



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The Gisholt MANUFACTURING Reamer

is made in shell, straight shank and taper shank types, with right hand spiral, left hand spiral or straight blade of high speed steel.

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

VOL. XXV. No. 1 January 6, 1921

Designing Fixtures for Holding Pistons

Preferences of Designer—Thickness of Wall—Accuracy of Finish Desired—Material Used—All These Points Have a Varying Influence on the Design of the Holding Arrangement

By F. SCRIBER

AS a means of propulsion nothing to-day is more common or more fundamental to this end than pistons which are as most everyone knows one of the basic units in automobile engine design and aircraft engine design not to mention innumerable other forms of engines, etc. Therefore, it will no doubt be interesting to study some of the designs of holding fixtures which are used for machining the same on chucking machines, engine lathes and various other forms of special rigid machines for turning these. Apart from the preferences of the individual designer which of course are more or less of an item in themselves the very nature of the piston such as thicknesses of walls, accuracy of finishes desired and material used have a varying influence on the design on the holding arrangement.

In Fig. 1 we have a piston 2 3-4 inches diameter made entirely of steel with thin walls of .060 inches thick at the open end of the piston. This piston was machined all over both inside and out except for a very small portion in back of the bosses which carry the connecting rod wrist pin. The fixture used for holding this after the piston had been machined inside and while the outside was turned and the piston ring grooves cut and end faced was mounted on a turret lathe, the body of this fixture being indicated at A; this was made of cast iron.

In this body was driven a steel portion B which was keyed in place; the piston was slipped over the diameter C against shoulder D, this bar being flatted off at E to clear the bosses of the piston. The square headed screw E is tightened by the operator and this coming against the beveled pin F forces pin G against a tapered end H, which in turn forces out four pins I, which equalize on the diameter J, thus securely holding the outer end of the piston against the strains of cutting. Three screws K, against which comes spring L, keep the four pins back against the beveled surfaces of the operating pin, while spring M forces the other pins back after the screw has been released, thereby permitting the piston to be removed upon completion of the cutting. At X in this illustration is shown the tool used for turning the outside of the piston, other tools used at this time being cutters held in front and rear cross-slide blocks on the machine for grooving and facing.

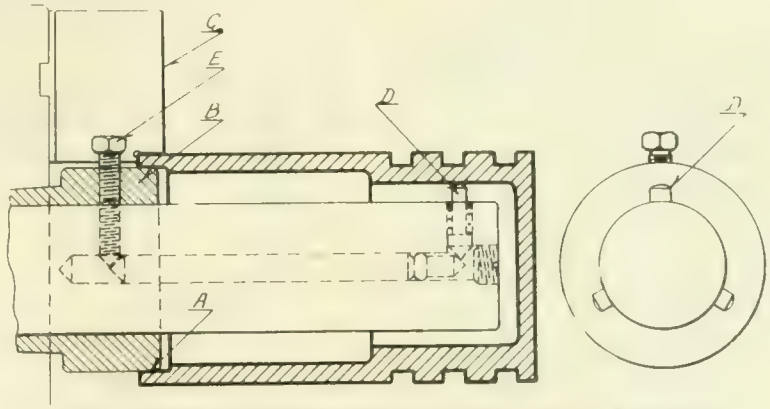


FIG. 2 PISTON HOLDER ARRANGED WITH CHUCK AS DRIVER.

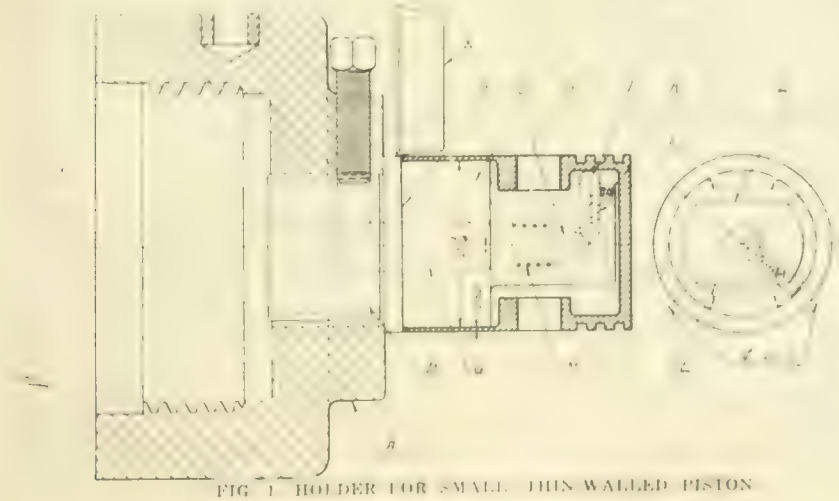


FIG. 1 HOLDER FOR SMALL THIN WALLED PISTON

In Fig. 2 we have an example of an arrangement, which although somewhat similar to the preceding, was used for machining the outside of a heavy cast iron piston. In this design of piston the diameter at A was first bored, also the chamber, while the outside of the open end was turned to the correct diameter for a length equal to the machined portion of the inside diameter. The piston was next pushed over a suitable holder B in the spindle of the machine and three soft jaws C in a chuck grip the piston at the open end over this holder. To hold the closed end steady and centralize it three pins D, which are expanded

by the screw E in the same manner as in the design previously described, are employed.

A holding device of different design is illustrated in Fig. 3. In this arrangement the piston is machined at X following which it is placed on the fixture shown, which consists of a cast iron body A screwed on the spindle nose of the turret lathe upon which is mounted a steel ring B over which the piston fits. Before this operation the hole for the connecting bar wrist pin has been bored out and through this hole is placed a pin C which also goes through a bar D. In the end of this bar D a draw rod E is threaded which goes through the spindle of the machine and at the outer end is attached a hand wheel F, in the end of the spindle is placed a bushing G and by turning the hand wheel the draw rod is caused to screw into the connection, thereby pulling the piston by means of the pin in the wrist pin holes securely back on the fixture.

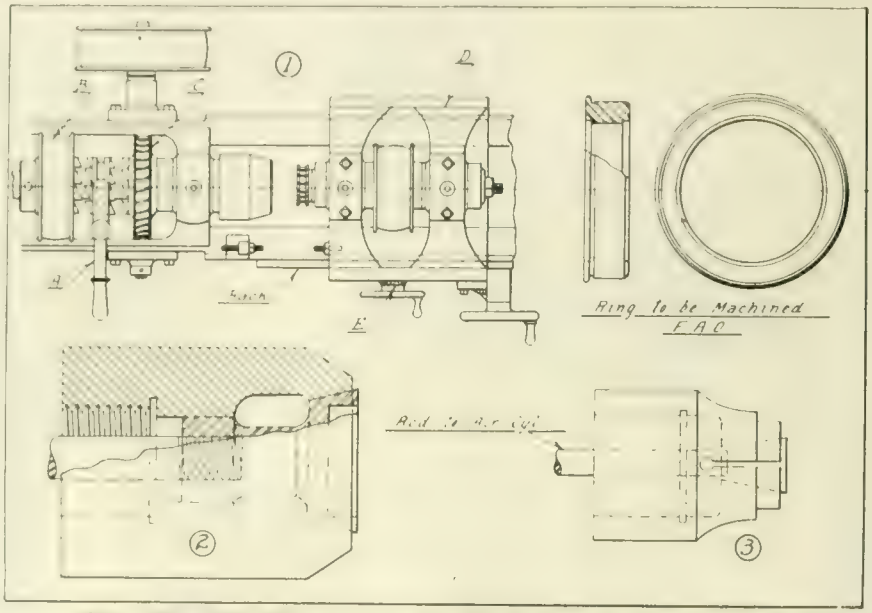
Fig. 5 shows an illustration of an arrangement having the same design except that as the wrist pin hole in the piston is not bored a double hooked bar is made to straddle the wrist pin hole bosses, therefore by tightening the hand wheel A at the end of the spindle through the medium of the drawback rod the hooked bar is caused to draw back into the spindle nose fixture thus pulling the piston securely against the seat C on the body of the fixture D. To compensate for the irregularities in the rough cast bosses of the piston this hooked bar E is made a floating fit in the holder. Small hand knob E is pinned to the end of the drawback rod, the advantage of this being to turn the hooked bar by means of the draw rod half way round so it will clear the bosses while the piston is put in position or removed. These four arrangements shown are all good designs which have proven satisfactory for making the parts shown. These particular holders were used for machining in quantities, they varying in diameter from the 2 3-4 size up to approximately 10 inches.

MACHINE FOR MILLING SPECIAL WASHERS

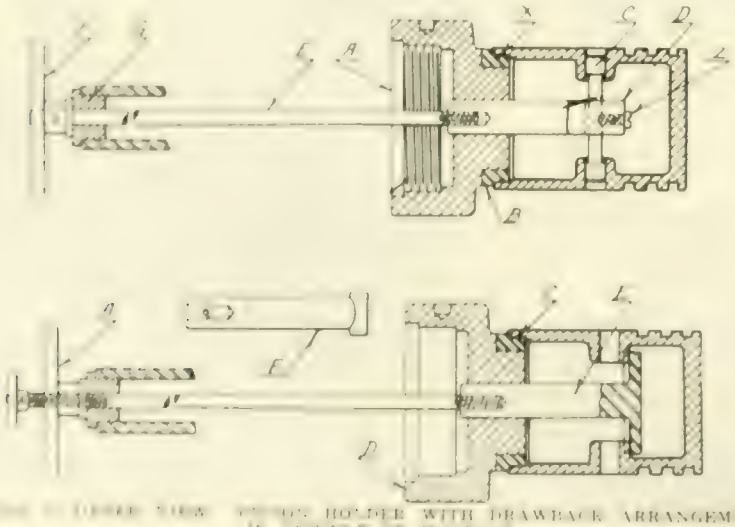
By G. Barrett

The accompanying sketch illustrates a special machine designed for milling steel rings for ring spinning frames. The rough rings are made on the Ajax forging machine, from solid round bars, and are afterwards faced to the desired width on a vertical mill. They must have a very smooth finish to prevent the cotton yarn from sticking during the spinning process. The machine here shown accomplished this with very good results and gave quick and accurate production. After facing, the rings are held in the collet chuck shown enlarged in Fig. 2. When trueing up the ring the clutch lever A is thrown over so that the clutch engages with the pulley B, which revolves the work spindle at high speed.

When ready for machining the clutch is engaged with the worm wheel C, this worm wheel being driven by means of a worm underneath on which the driving pulley is secured, the latter being operated by a quarter turn belt. An adjustable stop is provided for locating the carriage in the proper position when milling. The cutter is first fed to the desired depth, using the graduation on the cross feed spindle. The work spindle is allowed to make about three revolutions before the work is completed. Machining the outside is done in the same manner, the periphery being milled while the ring is held from the inside in the chuck shown in Fig. 3. The work produced from this machine was entirely satisfactory.



FIGS. 1 TO 3 INCLUSIVE SHOWING THE DETAILS OF THE ARRANGEMENT.



UPPER VIEW PISTON HOLDER WITH DRAWBACK ARRANGEMENT
IN PLACE ON MACHINE.
LOWER VIEW HOOKED TYPE OF PISTON DRAWBACK ROD

PROTECTING POLISHED METALS

A process has been invented in Germany for protecting polished metals which have to undergo annealing. As a rule, tarnishing results, but in this case the trouble is overcome through the use of a solution of boric oxide.

The solution is only applied as a very thin film over the articles to be annealed, but it is claimed that it completely excludes atmospheric oxygen. The film melts at a temperature varying between 550 and 650 deg. Cen., according to its composition, and acts as a protection so long as it remains solid. Steel, for example, remains bright when heated to the melting point of the composition, and no coloration takes place when the steel is tempered. It is stated to be still more effective in the molten or semi-molten condition, as it then forms a perfectly gas-tight cover round the article, even when heated to the highest temperature used in practice. The coating is perfectly fireproof, does not evaporate, and dissolves any oxidised matter on the surface of the heated metal. The coating can be applied either as a powder, sprinkled or dusted over the surface of the objects to be annealed, or as a liquid. It is soluble in water and methylated spirit, and the work to be annealed is simply dipped in the solution and allowed to dry. The coating peels off on cooling, or it may be dissolved in warm water.

Practical Pointers on Rolling Mill Operation

Making Cold Rolled Strip Steel—Rolling of Tin Plate—How to Obtain Best Results When Rolling Thin Sheet, and What Happens When Unequally-heated Pack is Inserted in the Rolls

By W. S. STANDIFORD

IN our December 26th issue, we told of the English and American methods of rolling, how to obtain large output when rolling their plates, also how to avoid waste. We also described the plain and universal type of mills, and how to obtain the best results from each. In this, the concluding part of the article we will start at the making of cold rolled strip steel.

Cold-Rolled Strip Steel

Another class of thin sheet steel for which there is a large demand is called "cold-rolled" strip steel and "ribbon-stock." The manufacture of this grade of metals differs radically from that of sheet steel; the red-hot steel billets first being reduced to a sufficiently thin gauge and width in a hoop or band mill, there being no cross rolling of the metal as is the case in sheet steel manufacture. It is made into coils in the hoop mill and goes to the cold-rolling department or is sold in the market in coil form. Hot rolling of steel in the hoop mill leaves the pores of the metal in an open or porous condition, no matter how smooth the bands look on their surfaces. On the other hand cold-rolling closes the pores and makes a denser product. The rolling of strip steel and ribbon stock is mostly done on rolls that generally have a body length of 8 or 12 inches, the roll diameter varying from 6 to 10 inches. Of course there are longer and thicker rolls used for the purpose of obtaining wider strips, but the average sized mill uses the small sizes of rolls listed above.

Strip mill rolls are turned or ground with a curve on their surfaces that is entirely opposite to those used for manufacturing hot rolled thin sheets; rolls for producing the latter require a concave surface, the deepest part being in the middle, while the ribbon stock and strip steel rolls must be slightly convex or crowned, the amount of crowning varying with their length and diameter. For small rolls of from 8 to 12 inches body length, the convexity varies from 0.001 to 0.015 inch high in their centres. This allows for spring or bending of the rolls which is necessarily heavy on cold rolling mills as contrasted with hot ones, the rule being that longer rolls require more crowning than do short body ones.

The degree of finish on hot mill rolls need not be nearly as smooth as that on the cold rolls. The surface on the former is sufficiently smooth as the roll lathe tool leaves it, but cold rolls require a shining body exterior and they also must be as free from surface scratches as possible, otherwise each scratch or mark will show on every strip or ribbon of steel that is run through the mill. The rolls should produce a bright shining finish on the strips and leave a surface that can be directly nickel-plated without the necessity of the metal having to be further buffed or polished.

By finishing the ribbon stock bright much time and expense are saved the consumer who regularly uses quantities of this steel. It is the usual practice of mills manufacturing cold-rolled ribbon or strip stock to anneal this metal between gauge reductions in cold rollings; and, contrary to the general opinion held among those uninitiated in rolling mill procedure, the temper is obtained not by annealing but by cold rolling after annealing, and it is at this stage of manufacture that the skill of the strip maker reaches its pinnacle of perfection.

PRACTICAL KNOWLEDGE

The author, being a practical man himself, can tell his story in everyday rolling mill language. He touches no technicalities, but tells the tale simply, concisely, and briefly. An article of this nature should be filed away for future reference, as we do not know very much, as a general rule, about rolling mill practice.

Five different degrees of hardness or tempers are produced by cold rolling. They are as follows: dead soft; soft; medium soft; half hard or bright rolled and full-hard. When the strip is thoroughly annealed the metal comes under the dead soft classification, and it is capable of being used for the most difficult of deep stampings or drawings. It is very much superior to the usual grades of sheet steel made for drawing purposes; its better quality being due to the fact that it has not been cross-rolled and also to the numerous cold rollings needed to reduce it to the desired thickness, the many cold rollings received making its texture very fibrous in character and increasing its tensile strength and ductility. The soft grade is for making ordinary kinds of bends and easy drawing operations in which a certain amount of stiffness is desired in the finished article. The medium soft quality is intended for use where a springy metal is desired, one capable of standing bending at right angles across its grain; it should also bend fairly well with the grain without breaking.

The hard, or full hard, as it is usually named, is the strips cold rolled to size and not annealed. This metal is intensely hard and it is only suitable for flat work such as for making washers, discs, and other flat work where no bending is needed. In purchasing strip steel always specify the gauge in thousandths of an inch or by Birmingham or Stubs gauge and not by the U. S. standard gauge. Mills making strip steel can furnish it in either wide sheets, which can be cut into strips of the desired width by the consumer or else it can be obtained in strips of the required width.

When stripper dies are used in certain kinds of stamping work it is best to use the sheared metal, as more accurate straight-edges are procured. The drawback to the strips that are rolled to proper width is that the middle parts of the sides of strips are bulged outward, it not being square and at a right angle to the top and bottom sides, so that for use in stripper die work it is not so good. The edges of the sheared strip will usually contain slight burrs on the edge of one side, which is made by the slitting knives. Strip steel is also used for making brake bands in the automobile trade, proving to give good service in that capacity. Strip steel is always oiled and boxed, or wrapped in burlap so as to prevent scratches and surface rust in shipping.

Rolling of Tin Plate

In the rolling of tin plate, which is made mostly out of the semi-finished steel bars, there is a loss of metal in the heating and rolling from the semi-finished to the finished form of from 6 to 8 per cent. Rolls for making tin plate are generally shorter in length than those used to roll heavier plates, such as those used for ships and boilers. The curvature of surface in the latter rolls are not as deep as the tin plate rolls. On account of the thinness of the gauge of metal rolled and the fact that no water is used on tin plate rolls, the latter require a deeper concave surface to allow for expansion. When a mill first starts rolling tin plates on a Monday morning it is customary to roll narrow sheets until the roll centres have expanded and are level, when wide sheets can be rolled. The bars from which these plates are rolled are 8 inches wide, and vary in thickness from $\frac{3}{8}$ to $\frac{5}{8}$ of an inch; the length varying according to the widths of the finished plates desired.

Turning of Tin Plate Rolls

In the turning of tin plate rolls, both rolls could be turned with a concave sur-

face, but it is found advisable in practice to turn one roll with a plane surface and put double the concavity in the other as the roll turning is done quicker by this method. After the plane surfaced roll is turned, the other one intended to have a concave surface is put into the lathe. The roll having a level surface is next put in the carriage on top, and the top roll is crossed so that their centres are out of line. This makes the middle part of each roll approach nearer to one another than their ends, the rolls being placed as close to each other as is practicable without the top roll revolving by friction. Narrow cuts are then taken from the centre of the roll, each cut being about 1½ inches wide. The top roll during the process of turning is let down so as to touch the roll in the lathe, from time to time, until the roll in the lathe has a curved surface and no light can be seen between the two rolls when they are touching.

The amount of crossing varies with the length and thickness of the rolls and also the time cycle of working. Where two 12-hour or three 8-hour shifts are worked, the usual amount of crossing is as follows: Rolls of 24-inches diameter by 32 inches long should be crossed 2¼ inches. Rolls 38 inches long and 24 inches diameter require a 2½ inch crossing; 24 inch diameter rolls having a length of 40 inches need a 2⅝ inch crossing. If rolls have a length of 48 inches it will only be necessary to cross them 2⅝ inches as this amount will be found by experience to be amply sufficient. This length of roll does not require so much crossing as some other sizes on account of the mill crew not being able to work wide sheets as fast as they can handle narrow ones, consequently the rolls do not attain such a high temperature as narrower rolls do. In regard to rolling 34 inch wide sheets on rolls having a body length of 48 inches, the rolls having been crossed in the lathe 2¾ inches, and rolling this width of sheets continuously it has been found that the necks of the rolls will heat too much and more than their centres, the result being that the pack of sheets will not lay flat and open easily.

Getting the Best Results

To get the very best results in thin sheet rolling the top roll should be two inches smaller in diameter than the bottom one. The top roll, by reason of its having a smaller diameter, bites deeper into the pack of sheets, and as it has a slower rate of rotation its surface speed, differing from that of the bottom roll, produces the result that the pack of sheets lies flat and opens up easier. Sheet rolls should not be worked at too high a temperature as they are liable to crack, in fact, many sheet mill rollers crack such rolls by working them at too high a heat, the management not knowing any better, putting the cracking down to accidental causes instead of its being due to the roller's carelessness, as the former, by heating the rolls too suddenly and by having the ends of the rolls vary too much in temperature from their centres can cause the best rolls made to crack. Rolls once cracked soon break in two. When rolls have a deep blue color in their centres and the ends are purple, the centres being about 600 degs. Fahr., this is the highest temperature that they should be allowed to get, as they are almost certain to break or develop fire cracks and have pieces break out of the surface. They also have a burned or rough surface. Chilled rolls used on finishing sheet mills are made from cast iron and have their chilled surfaces ¾ inch deep, while the rest of the roll is soft cast iron. The combining of soft centre rolls having a chilled outside surface makes considerable trouble in the hot rolling process as the expansion of the chilled structure of cast iron is about double that of the soft gray iron centre. Should the roll be permitted to heat too rapidly the expansion will tear the roll in two, which is due to the different amounts of expansion between the chilled and soft iron.

Cast iron, when heated, has a certain amount of permanent expansion, and it never contracts back to the original size when it is cold, but always remains slightly larger than it was before heating. This causes the grain of the metal to become porous in consequence. The greater the depth of chill on a roll the greater the expansion will be. When a chilled roll has been reduced in diameter by frequent dressing it loses its power of expansion, the result being that the roll turner has to put less concavity in the roll.

Two Important Points

There are two important points that a sheet steel roller has to contend with in the rolling of the above metal. The first is to make the pack of sheets open easily; the second is to make them lay flat when finished. The second is the more difficult, as to make a heat of sheets lay perfectly flat is not an easy thing to do. The roller may work the screws on housings exactly alike on each pack of sheets, yet each one will have a different shape when finished. You will have one sheet curved or dished like a saucer, another pack of sheets will buckle, and the sheets composing another pack will draw to one side, all of them being made in the same heat. Uneven heating in the furnace will cause the pack of sheets while they are in the rolls to run off to one side. The heater placed the packs in the furnace, and when they were partially heated they were turned up on their edges. The sides of the pack being upward and in the open part of the furnace they were more exposed to the heat and flames than the sides at bottom of furnace. Thus one side or edge of the pack soon acquired a greater temperature than the other, which may vary from 25 to 50 degrees.

What Happens

When an unequally heated pack is inserted in the rolls, the hot side, or that side in which the temperature has been raised above the other, will pull faster and move ahead of the other sections. This causes the sheets to shift their positions on one another in the pack and to pinch, buckle and show stress marks. By getting the metal too hot in the furnace and the heat evenly distributed over the pack surface, the latter will be

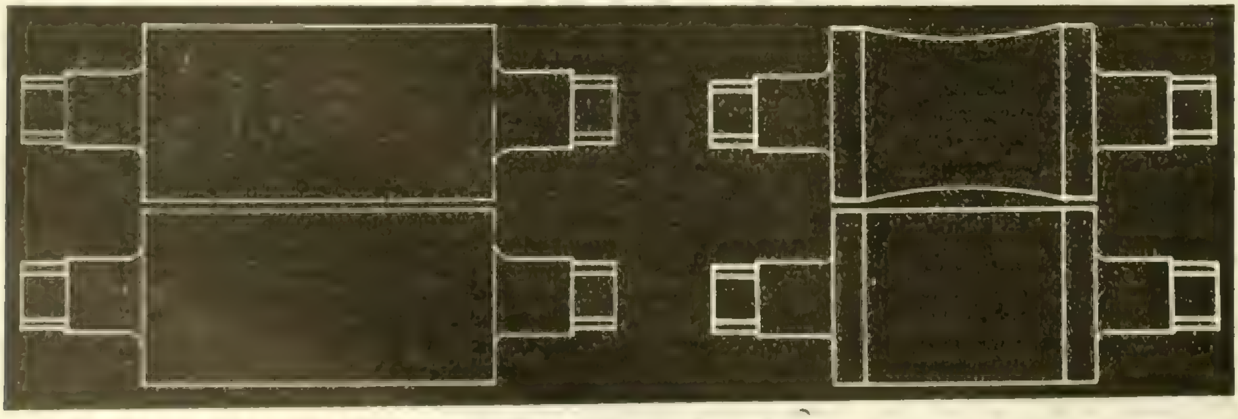


FIG. 2—ROLLS FOR MAKING HEAVY PLATES ON AMERICAN MILLS. THE [illegible] ARE TURNED FLAT AND [illegible] HARD TO PREVENT THE ROLL EXPANSION.

FIG. 3—HEAVY ENGLISH PLATE MILL ROLLS WHICH ARE WORKED DRY. THE ONE ROLL CARRIES ENOUGH CURVATURE TO SAVE TURNING. CONCAVE SURFACE IS EXAGGERATED TO SHOW THE IDEA CLEARLY.

full of scale, and if the rolls are worn slightly hollow in the middle (which is generally the case toward the end of a week's run) the scale will be pushed along towards the centres of the plates and become embedded in the metal, which soon causes trouble in the pickling department, as the pickling fluid will eat into and dissolve the metal on the smooth parts of the plates long before the scale is removed by the acid. This never occurs when the sheets contain very little scale upon their surfaces. From the foregoing it will readily be noted the importance of a correct heating temperature, especially when rolls are worn slightly hollow in their centres.

The turning of chilled iron rolls for manufacturing thin sheets such as are used for making cooking utensils, etc., is in general a very tedious operation, and attempts have been made to do this work by means of specially constructed grinding machines. This is a great success, both from an economical and quality standpoint. The grinding of rolls can be done in about half the time it takes a roll-turner to turn them on the lathe, while the rolls ground on the machine have a smoother finish than any lathe tool will make, they being more accurately level in every respect. Sometimes a jam in the rolls will cause what is technically known as a "burnt spot." Its shape varies, depending on the form of the material rolled. These burnt spots occur on hot mill rolls only. In sheet mill rolls these hard places take the form of a long streak of compressed chilled iron, extending parallel to the axis of the roll, their depths varying from 1-32 to ⅛ of an inch.

Chilled Cast Iron Rolls

Chilled cast iron is the hardest metal a roll turner has to work. The tool used is very little harder than the chilled iron. In order to cut any metal at all and give the tool a chance to do the cutting, a roll has to revolve at a very slow speed in the lathe, its periphery moving at a rate of one-half a revolution per minute. When a burnt spot is encountered, owing to the metal getting compressed by the sudden stoppage of the rolls, the compressed metal is rendered as hard as the metal in the tool, if not harder, the result being that when the tool strikes the hard spot the edge of tool breaks out, sliding over the top and refusing to cut at all. To get over this trouble he must sharpen his tool, put it in a lathe, take a very light cut until the burnt spot nears, then sudednly take a very heavy cut so as to get under it and lift it out. When it is ⅛ inch deep it has to be broken down little by little, as a roll-turning tool will not take a deep cut in ⅛ inch chilled iron. Doing this work is tedious and dangerous as pieces of the spot and turning tool fly out into the air with very great force. The writer has seen a roll turner have an artery pierced in his arm from this source. It is hardly necessary to say that after pressing the lever down to make the tool take the "lifting-out" cut, that a roll turner doesn't stay in the vicinity of the lathe, but retires about eight feet to one side.

After the work is completed a roll is made 3-16 to ⅜ inch smaller in diameter, it also being out of round shape, and the large amount of metal required in the turning out of the hard spot being wasted. The turning tool is also ruined until it is dressed and put into shape by a blacksmith. There are cases in which the tool is rendered totally unfit by breaking into several pieces, so that it wouldn't pay a blacksmith to spend any time upon it. It will be seen from the above that it is absolutely necessary to cut the burnt spot entirely out of a roll in order to obtain a smooth surface. When an emery wheel roll grinder is used the emery wheel being very much harder than any burnt spot in a chilled iron roll, the compressed metal is very easily and quickly ground with the rest of the roll's surface, only enough metal requiring to be removed to smooth up the roll's periphery. The burnt spot having a smooth surface like the rest of the roll, it does not interfere with manufacturing good plates. Roll-grinding machines are money savers and their use is increasing every year.

The writer knows of mills where the rolls are necked in the usual manner in a lathe, the necks in such cases being left 1-32 inch oversize, then they are ground to their correct diameter in a roll grinder.

Ground Roll Necks

Ground roll necks, owing to their perfection in finish and roundness, make the rolls operate very much better in the mill housings than when they are turned in a roll lathe, thus a roller is enabled in starting a new order to set his rolls much quicker and maintain the desired gauge thickness easily. The reasons controlling this factor are due to the fact that, no matter how sharp a necking tool is used in a roll lathe, the necks of all rolls are always, to a certain extent, out of true cylindrical shape, as the roll-turning tool in lathes of this character requires to be operated below the roll's centre and thus it exerts an upward thrust against centres and wears them slightly oval in shape. An emery wheel on a roll grinder on the other hand requires only a slight pressure against the work, the grains of emery in the wheel touching the roll's surface at a very narrow angle and being far harder than any tool and travelling at a fast speed, soon reduces the necks to a true cylindrical shape. On this account rolls having perfect journals revolve better in the mill housings, there being no high spots on them to grind the bearings to an uneven shape.

In the handling of rolls for making thin sheets, the roller has to use judgment if one set of rolls are smooth and the other rough. Thus, if the roughing rolls are freshly dressed and smooth, while the surfaces of the finishing ones are rough—by this it is meant that they have been in use for some time—the finished sheets will have a rough and spotty appearance. If the roughing rolls have a rough surface and the finishing rolls are smooth and the reductions of metal on the latter are sufficient to remove the roughing roll surface marks, the finished sheets will be smooth. Of course, in a case of this kind the finishing rolls will not keep smooth for as long a time as when both the roughing and finishing sets are freshly dressed and put into a mill at the same time. The foregoing shows that a roller on a sheet mill has no cinch while making sheet iron, steel, etc., and he has to be continually on his guard and use judgment as each lot of metal rolled behaves in a different manner while being rolled.

Should Be Perfect As Possible

Where steel or iron sheets are to be coated with tin they require to be as perfect as possible from all buckles and blemishes, as every imperfection will show on the finished product when the tin plate dipper gets through with his work. The dipper also plays an important part in turning out smooth-appearing sheets, it being possible on his part—if the pickling and dipping into the molten tin is not done carefully—to produce a very rough and uneven-looking coating, which may be blamed upon the quality of sheets coming from the mill, when in reality the fault is with the tin dipper. To test whether a sheet of tin plate is evenly coated, lay it on a flat surface and place the eyes at a height of about two inches from its top and look diagonally over it from one corner to another. If it has a good level and even coating of tin, it will be free from waves and spots, if otherwise the defects will be easily seen. Should such a sheet be looked directly down upon from its top, nothing but its largest defects will show as the reflection from the bright surface will interfere with seeing the small waves of unequally deposited tin

A FEW POINTS TO REMEMBER

Strip mill rolls are turned, or ground, with a bevel on their surfaces that is entirely opposite to those used for manufacturing hot rolled thin sheets.

The degree of finish on hot mill rolls need not be as great as that on cold rolls.

It is good practice to anneal cold-rolled ribbon stock, or strip stock, between gauge reductions in cold rollings.

Five different degrees of hardness are produced by cold rolling, dead soft, soft, medium soft, half hard or bright rolled, and full hard.

and spots. By glancing over a sheet diagonally with the eyes occupying a low position, shadows will be cast by each ridge of tin, due to uneven flowing.

The part played by the roll designer in these days of efficiency methods is most important, as the rapid progress in mechanical arts is due, to a great extent, to the roll designer, who is often called upon by various inventors and mechanical engineers to design rolls for making difficult sections in iron, steel and also the non-ferrous metals. In those early days when the iron and steel industry was in its infancy there were no roll designers or foremen roll turners; the designing of rolls being usually done by the roller, a draftsman, mill superintendent, or foreman machinist, who generally made a rough sketch of the passes to be turned in a new set of rolls by the roll-turner. As the ironmasters' business gradually increased it was found necessary and more satisfactory in order to obtain greater efficiency to do away with such haphazard methods and to put the responsibility for the proper designing of the rolls into the hands of one man, who became in time a specialist, and was called a roll designer. Thus, very large mills employ a roll designer —who is also a roll turner of wide experience, and who does nothing else but design rolls for the orders of different shaped sections that are continually being received.

To Test Ductility

In cases of this kind the actual turning of the rolls from the designs furnished is done by journeymen roll turners who are under the supervision of a foreman roll turner. In small mills employing 150 or more men it is customary for the management to employ one roll turner who is capable of both the designing and turning of rolls. Small mills, as a general rule, only receive an occasional order from outside sources that call for new shapes, so that the workman can easily keep up the supply of freshly-dressed rolls and also do any small amount of designing work that comes along.

In modern rolling mills the roll turner has a well-lighted shop of his own to do the work in. Small mills mostly place the roll lathe in their machine shop amongst the machinists' lathes, which proves to be very good practice, as the power requirements are grouped together; in addition, most machine shops are so designed as to be very well illuminated and also free from mill dust and smoke.

Those who use an occasional black or uncoated sheet of iron or steel for repair work are often at a loss to know whether the metal is composed of iron or steel. For the benefit of such readers who desire to make a test of any sheets which they may have on hand, the following method of testing will prove satisfactory, as wrought iron and steel sheets can be easily distinguished from each other. Proceed as follows: first polish with emery cloth or a file a spot on the metal until it is bright; then place a few drops of nitric acid on the place and leave it alone for a few minutes. The spot will then appear of an ash-grey color on wrought iron, brownish-black on mild steel, and a deep black on cast iron. It can be not only used for testing sheets and bars but also for cast iron, where any doubt exists in regard to the identity of the latter metal. In handling any acid care should be taken not to get any of it upon the hands or clothing as acids are very dangerous to handle.

Actual Turning of Rolls

To test the ductility or quality of any sheet, bend it back and forth until it breaks in two. If it cracks on the back surface after one or two bends it is not annealed very well. Should the piece of sheet steel withstand many bendings it will be found to be a very tough, fibrous metal. The above is only a rough shop test but it will serve to give an idea of the quality of any sheet when anyone desires to select a tough sheet of metal to be used in emergency repair work or otherwise. The testing of tin and galvanized coatings by bendings is also a very useful kink, as it enables a person to find out if the pickling and cleaning operations have been properly done, which is necessary, as otherwise bending will make the coatings peel off when their adherence to their metal base is slight. In regard to the engine power required to drive sheet mills and plate rolls as contrasted with the power needed to operate rolls for making other sections, it has been found out by experience that engines and electric motors used to drive rolls for manufacturing heavy sheets and plates of all descriptions require to be far more powerful than those needed for making other shapes and sections. This is due to the position of the metal rolled being parallel to the rolls' axes, it exerting a force that is comparable to a powerful brake. For the latter reason large diameters of necks and roll bodies are used in mills of this kind. Large diameter necks in turn also create more friction on the bearings, which, coupled together with the pressure that is exerted by the metal being rolled thus makes more power necessary. To the uninitiated person who looks at any sheet mill crew working rolling either sheets for automobiles or for tin plate, etc., the manufacture of these sheets looks very simple and easy and they haven't the least idea of the trouble that can occur unless the heaters and mill crews work together in harmony and for the general good of all.

Moving Office.—The J. A. M. Taylor Machine Tool Supplies has moved from the Stair building, at the corner of Bay and Adelaide streets, Toronto, to new quarters at 77 Adelaide street west.

THE USE OF PEAT AS FUEL

In a lecture delivered by Professor P. F. Purcell before the Royal Dublin Society and published by the Fuel Research Board, it is stated that the total amount of peat used in Ireland lies between six and eight million tons per annum, as compared with 4¾ million tons of coal imported and 90,000 tons raised in the country. Irish peat has advantages in two respects, (1) the ash content is comparatively low, and (2) the nitrogen content is comparatively high. It is, therefore, a good peat for the recovery of sulphate of ammonia. Peat, generally speaking, contains from 90 to 95 per cent. of water, and part of this moisture cannot be pressed out owing to it being held by the colloidal matter in the peat. There are at present only two installations in Ireland where this fuel has been successfully employed for the generation of power. One is at Clifton, in Galway, where the Marconi Company uses 5,000 to 6,000 tons of air-dried peat to generate the power for the wireless station. The other is at Portadown, where the power for a linen factory is obtained from a producer gas plant using peat as the fuel.

We understand that preparations for the British Industries Fair, Birmingham, 1921, which is to be held in the permanent buildings of the Castle Bromwich Aerodrome from February 21st to March 4th next, are now well under way. It will be run under the control of the Board of Trade and the Birmingham Municipality and Chamber of Commerce. None but British and British Empire manufacturing firms will be allowed to exhibit at the fair, and, and none but bona-fide British or foreign buyers may be visitors by invitation of the Board of Trade.

In a paper dealing with the uses of aluminium for electric installations, Mr. E. O. Pannell, the author, states that aluminium can be drawn three times as far as copper without having to anneal it. The finished wire should indicate 58 to 62 per cent. of the conductance of copper wire of the same size, but it is usual to take 60 per cent. for this figure and a tensile strength of 24,000 pounds per square inch. Thus, if it is required to replace a copper wire on an overhead line with one of aluminium, the latter must have a 29 per cent. greater diameter and a 66 per cent. greater area. To increase the tensile strength and so permit a reduction in the sag of the conductor between the supports aluminium strands are laid around a core of steel wires. The steel wires are double galvanized and impregnated with fish oil to prevent corrosion. A cable of this type is about 35 per cent. heavier than aluminium, and costs, it is stated, 4 to 5 per cent. more; but it has a sag on long spans of 50 per cent. less, so that especially high towers are obviated.

Special Two Spindle Semi-Automatic Miller

A Machine Made for a Special Purpose, viz., to Mill Transmission Covers—Two Covers are Milled at One Setting—Special Locking Devices are Used

By J. H. MOORE

THE TWO Spindle Semi-Automatic Horizontal Miller described herein, is a new departure in shop equipment. Figs. 1 and 2 illustrate two different views of this machine, and the Ford-Smith Machine Co., Ltd., Hamilton, Canada, who are the designers and manufacturers of this Miller, have given us some interesting data regarding the same.

The machine was made for one of the large motor companies to mill their transmission covers on a new self-starter engine. Two of these covers are shown on the table of machine at Fig. 2. These covers are so designed that there are two parallel faces, one slightly ahead of the other, to be milled. In order to procure maximum production the special machine was designed. This machine is milling during a very large proportion of its running time, as the operator clamps one cover on the turntable while the other is being milled. An automatic rapid power traverse to the turntable is also provided, and it is largely by these features that such a large production is maintained.

The machine is of exceptional rugged design, and the location of both spindles can be clearly noted at Fig. 1. A feature of the design was the adoption of standard parts as far as possible, that is, the parts going to make up the regular type of Ford-Smith Miller.

The column is practically a duplicate of their heavy model standard type, but shortened to bring the turntable top to the most convenient height for the operator. Fig. 3 illustrates clearly some interesting features in the machine, and for reference purposes we will speak of the parts by symbol numbers as marked on the line drawing.

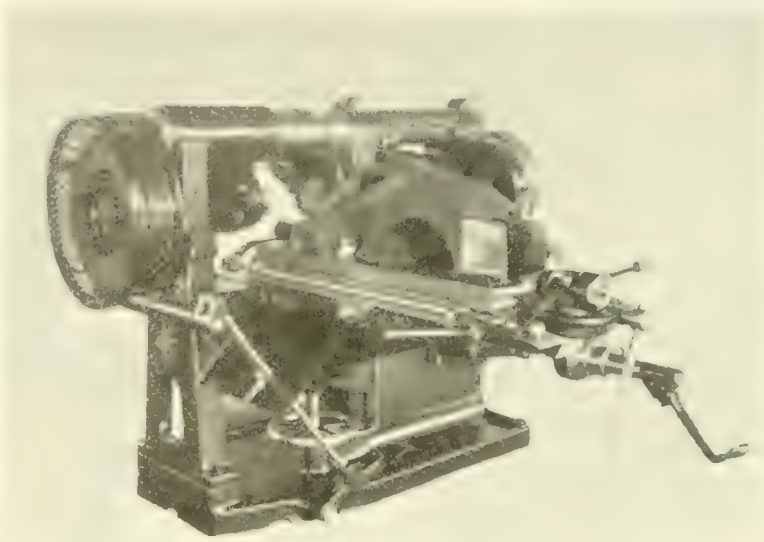


FIG. 2. THIS VIEW SHOWS BOTH COVERS IN POSITION, WITH TABLE BACK FROM THE SPINDLE.

The surfaces that are to be milled can be seen clearly on the outline drawing of the parts. Two castings are placed on the turntable at once, and held down by special bolts and clamps, see 19 AM 27. The turntable is pivoted in the center, and revolves on the stud 8 AM20. Wear on this swivel stud can be taken up by means of the conical sleeve No. 9 AM20, and split outer ring No. 10 AM20.

The method of locking the table in position is well worthy of note. Two locating plugs for engaging the turntable edge are employed and these are not entirely dependent upon springs. The locating plugs No. 2 AM17 are made of tool steel hardened and tapered where they engage with the hardened tool steel blocks No. 33 AM27 set in the turntable. The plug nearest the cutter, and consequently the most important one is positively pulled into engagement with its notch by means of the side locking cam No. 37 AM27. This, of course, prevents any radial play.

To revolve the turntable a pull on the handle No. 2 AM13 releases both plugs, as the handle just referred to operates in turn the rod No. 11 AM17, and the lever No. 4 AM13. In this way both plugs are controlled from one handle.

The method of clamping turntable rigidly, after it has been located, is also worth mentioning. This is accomplished by means of two floating clamps, No. 1 AM21 and No. 2 AM21. Both these clamps are operated from one handle in front of machine. This handle is shown at No. 8 AM17. These clamps float and the holding down grip is equalized on all four corners. The tension rod No. 7 AM17 equalizes the pressure by connecting the front and rear clamps. A good powerful grip is obtained and no [illegible] of the turntable is possible.

When it is desired to leave the turntable in an unlocked position, while swinging the same, the little latch is

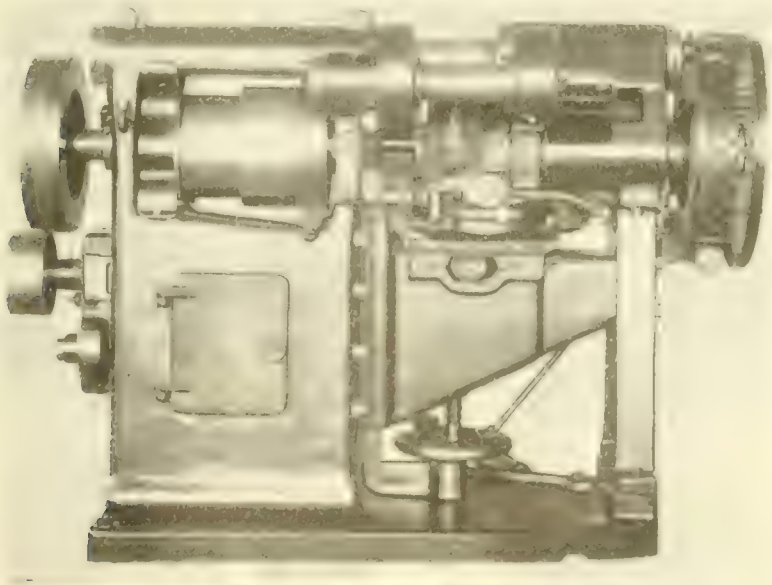


FIG. 1. GENERAL VIEW OF THE SPECIAL MACHINE.

turned a half turn and engages with the pin shown in lower view. Another feature in this machine is that the outer cutter head can be adjusted along the overarm in thousandths by means of a thread on the arm, together with suitable lock nuts. To take care of wear in the cutter a fine adjustment is provided on the cross table by screw No. 16 AM17. On making the necessary adjustment on the main spindle cutter the outer cutter head is likewise adjusted to suit the amount moved. The method of bracing the overarm and base is so self-apparent that no mention need be made except that slotted holes are placed in outer cutter head to allow for adjustment.

To prevent the workman getting hit by revolving handle of table a special safety handle No. 13 AM13 is provided. This handle is so constructed that when the hand is removed the handle itself is kicked out of position by the pin and spring No. 17 AM27. No danger can follow as the handle cannot revolve, but hangs down idle.

Fig. 2 shows the machine provided with a brake lever. A metal band goes around the enclosed flywheel, and the operator after shutting off his power can soon stop the machine by stepping on the treadle. Vertical adjustment to the knee is obtained by means of handwheel shown.

The object in having two flywheels on the machine was to eliminate as far as possible all vibrations at the cutters, and the installation of these wheels has proved worth while as they accomplish perfectly the duty alloted them. As the material milled in this case is dry, no pump system is required.

The feed box and rapid power box is driven from the countershaft and not from the main spindle, as is usually the case. In this way the rapid power can be engaged for returning the table with the spindle stopped. The inner side of the table is provided with three stops. The end stop trips the feed when the cut is finished. The middle stop automatically engages the feed at the right place when the table is moving in quickly under the rapid power. The outer end stop trips the rapid power when the table is returned after cut is completed Push knobs are provided, making these various motions self selective, thus avoiding chances of damage to the mechanism.

The faces being milled on this work are approximately 4¾ x 4½″ and a surface is milled at bottom of boss as well as on the side. From 1-32″ to 5-32″ of cast iron is removed, depending upon the castings, and a feed of 4″ per minute is used. Roughly speaking, 160 of these covers are completed every eight hours. Results with this machine have proven that it pays, when necessary, to make special equipment for such duplicate type of work.

There are various methods of preserving timber, and some of these were given recently in the Building Age. They comment as follows: The steeping process consists merely in soaking the timber in a water solution of a preservative. The wood must be thoroughly seasoned and left in the solution one day for each inch in thickness and one additional day. After treatment, the timber should be air-dried before using. Zinc chloride attacks lead paints, but is very desirable otherwise. Mercuric chloride is very effective, but is poisonous and has a decided corrosive action on steels. Sodium fluoride does not attack paint, is not corrosive, and in most other respects is very desirable. Timbers may be coated with coal tar creosote by a brush treatment, by dipping in hot oil for five to fifteen minutes, or by the hot and cold bath method. This method consists in submerging the lumber in hot oil for several hours and then either allowing the oil to cool down slowly with the wood in it or plunging the wood into cool oil and leaving it for several hours. Coal tar creosote is objected to by some insurance companies, but whether or not it really does add greatly to the inflammability of wood is a debatable question.

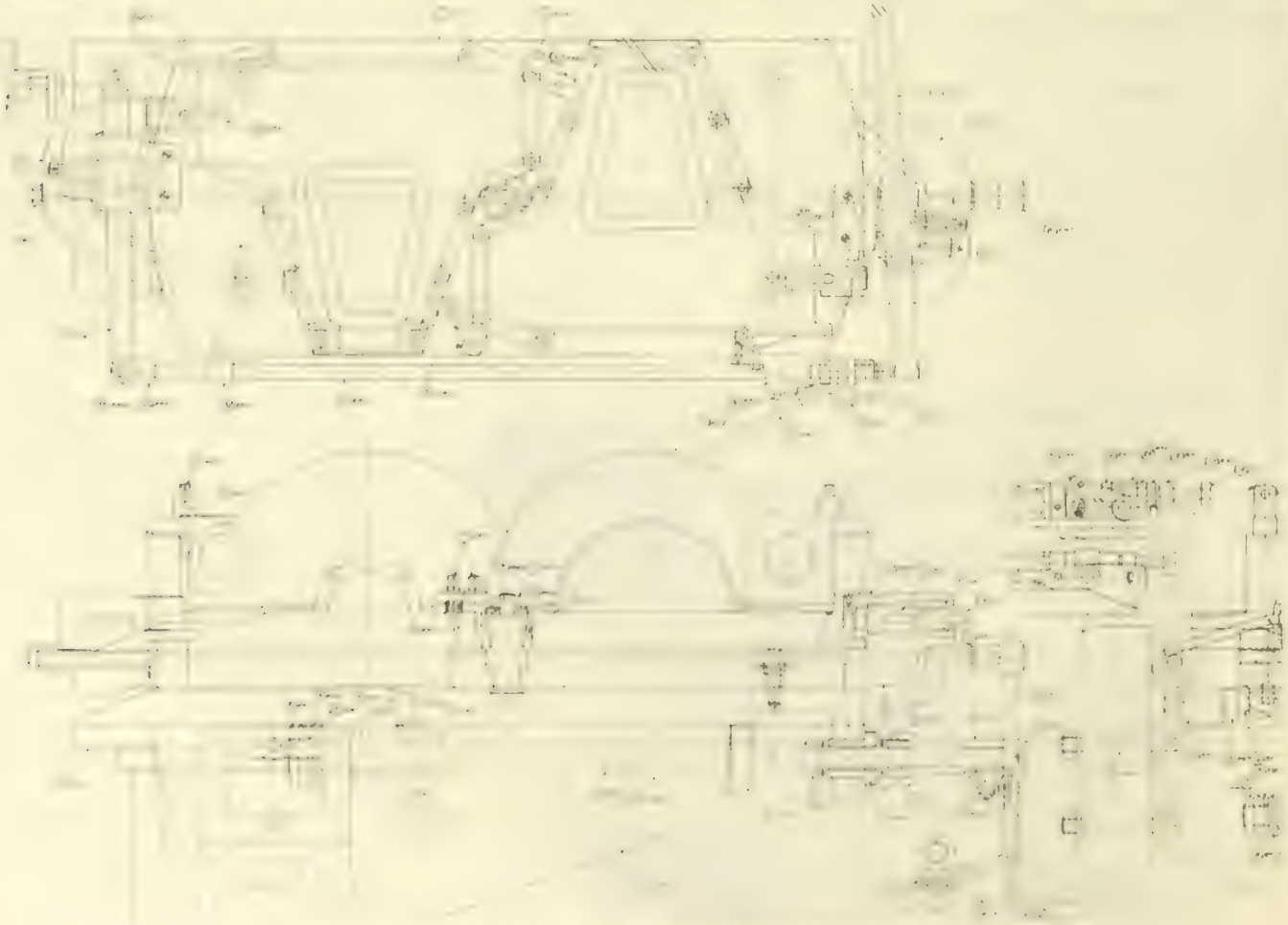


FIG. 1 THE PARTIAL SECTIONAL VIEW ILLUSTRATES VARIOUS FEATURES REFER TO THE TEXT MATTER FOR DESCRIPTION

WHAT OUR READERS THINK AND DO

DRILLING JIG WITH FLOATING CLAMP BAR

John S. Watts

The drilling operation on the link shown in Fig. 1 presents a rather interesting problem by reason of the location of the holes, having to be in correct relation to three surfaces. The link is a steel casting for a picking belt, which is virtually a steel plate conveyor. The plates are five feet wide and have each a pair of links riveted to them so as to form two complete chains, one at each side of the conveyor. There are two sprockets on the driving shaft, with teeth to take the links, these teeth meshing with the links at the point marked "a."

The plate is shown dotted in Fig. 1, and it will be noticed that it projects at one end to lap over the preceding plate, to prevent any leakage of coal.

The holes for the rivets connecting the plate to the link are cored, the only machine work being the drilling of the pin holes. From the above it will be seen that the requirements are as follows:

First, the centre lines of the holes must be square with a line drawn through the centres of the double eye and single eye.

Second, in order that the plates will mesh correctly, the pin holes must be drilled at the correct distances from the surfaces of the pad "b," to which the plate is to be riveted.

Third, to ensure that each of the two links on a plate will mesh with the two sprockets correctly, the two pin holes must be the correct distance from point "a."

In Fig. 2 is shown the jig, and we will show how each of the above requirements have been met.

In designing the jig to fulfill the first requirement we must remember that the link is not to be machined and that therefore the actual dimensions of the castings will be apt to vary slightly from the drawing sizes. For this reason the width of the space between the jaws of the double eye of the link is ⅛ of an inch greater than the width of the single eye.

The spaces in the jig into which the double eye and single eye fit, respectively, must be greater than the widths of these parts of the casting as given by the drawing. The clearances should be one-sixteenth to ensure that any casting that will go into the jig will also fit into its place in the chain. For instance, the maximum over-size the jig will admit on the single-eye is one-sixteenth and the maximum under-size on the space between the jaws of the double-eye is also one-sixteenth, and as the drawing gives one-eighth clearance, the maximum width of single eye will just go into the minimum width of space in the double eye.

When the link is placed in the jig it rests on one face of the single eye and an inside face of the double-eye, and as any over-size in the casting will probably be equal at both places, the centre line of the link will lie in a horizontal plane. In any case we are assured that any link that will enter the jig will fit the other links, and that at least two of the faces of the bosses are in their correct location and will be as good a job as can be gotten with rough castings.

The second and third requirements must be studied together and in the jig shown this is accomplished by having the casting clamped against two surfaces, one of which controls the location of the surface "a" and the other that of "b." When the casting is being entered into the jig, the clamp is swung out on its hinge and the casting pushed into place, the clamp swinging in as the casting enters the jig. Tightening up the thumb screw causes the clamp, first, to push against the end of the link and so press the point "a" against the stop in the jig provided to locate this point, and then, secondly, to force the link into the jig until the pad "b" is against the surface of the jig at the back, which locates the position of the pad in reference to the holes. As will be seen, we now have the casting clamped in the jig in the position desired to fulfill the three requirements enumerated above.

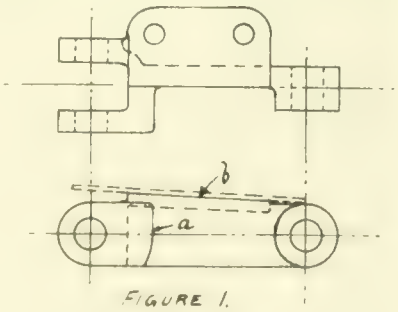


FIGURE 1.

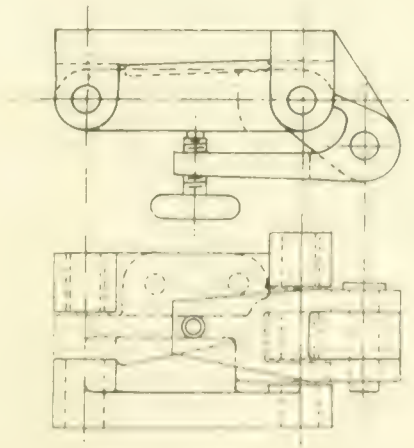


FIGURE 2

FIGS. 1 AND 2 ILLUSTRATING THE PART USED AND THE JIG

This would not be possible of attainment by the use of a single clamp, as there would be no assurance that surface "a" would be correctly located. To depend upon the operator pressing the casting against the stop is to depend upon "a broken reed." And if two clamp screws were fitted, the casting would be easily placed wrong by tightening up the wrong clamp first. Then also the operation would consume more time than that required using the jig shown.

To remove the casting from the jig it is only necessary to slack up the thumb screw a few turns, when the link can be withdrawn, as the clamp swings out of the way as the link comes out.

Creosoted wood cannot be painted over successfully, because the oil quickly comes through the paint and discolors it. Although pressure treatments are the most expensive they are the most effective because they result in the greatest absorption and penetration of preservative. Roof planking should receive 8 lb. to 12 lb. of creosote per cubic foot, or ½ lb. of the salt if zinc chloride be used. Such treatment should add at least several years to the life of roof plank. Lumber should be cut to final dimensions before treatment. Whenever it becomes necessary to cut into treated timber the untreated wood exposed by cutting should be given two brush coats of creosote or some other preservative.

Safeguarding Operation of Industrial Cranes

Crane Inspection, Safety Devices, Proper Slings, Duties of Operator, Proper Chains to Use for Different Purposes, the Endless Chain Sling, Identification of Chains

By JOHN A. HOPE

THE rules and regulations, herewith set forth, governing the shop maintenance of cranes and hoisting chains, and care of the same, is submitted by the writer, recognizing the importance and considerate attention that has been given to this subject by one of Canada's leading railroad companies, in safeguarding workmen from injury. It is doubtless true that many industrial firms have adopted ways and means for the protection of the workmen that may be similar to those here given, but a brief discussion of some details at this time may prove beneficial to many of the readers.

Shop Cranes

The general construction of modern workshops provide ample overhead room for carrier cranes, and according to the length of the building and the nature of the work, two or more of these cranes may be operating on the one runway, with a minimum tracking height of about 30 feet from the floor. The duties of these cranes involve the rapid transit of shop material from one department to another, where floor conveyances are not convenient. The operators in charge of the cranes are constantly engaged in the different positions below them and seldom are required to watch the movement of the crane along the tracks, and therefore assume that there are no obstructions to the crane tracking when moving along the rails. This makes shop orders effective that no class of workmen, steam fitters, etc., working on maintenance of building, are allowed to work in the vicinity of cranes, except in the case of emergency repairs which must necessitate the stopping of the crane from operating in the section where the trouble may be.

Crane Indication

It is most advisable that all cranes be painted with a light distinguishable color, to contrast sharply with the building interior and surroundings, so that they will be quite noticeable to all floor men in the works; also that the rated capacity of the crane be stenciled in large lettering on both sides or bridges. This capacity should always read in tons, as men do not grasp the significance of pounds capacity as well as they do tonnage.

Crane Safety Devices

In order to facilitate repairs, all cranes should be equipped with suitable runways that will provide easy access to carrying transmission, propelling gears, bearings, motors, etc. These runways likewise permit of ready inspection at all times. All overhead crane equipment should be controlled by limit switches for extreme load height; also include the best features in drum clutch and brake devices, automatic gong ringer, etc.

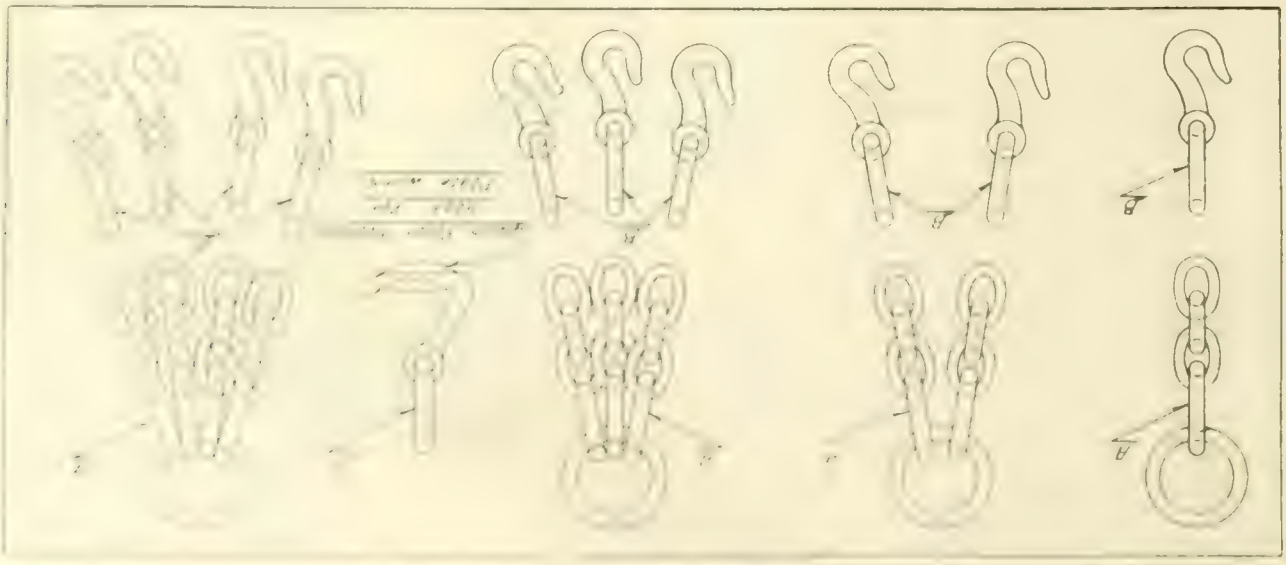
Crane Inspection

Whether the number of cranes warrant an inspector on the job all of the time or only part of it, it is necessary that cranes receive a close inspection at least once a week. This inspection must include a very careful examination of the hoisting cables, to ascertain that there are no damaged or broken strands, and that cable sheaves are not worn to cause any cable defects. It is possible and expected that a good brand of cable, kept in good condition by frequent oiling and used for moderate lifting within crane capacity, should at least give a satisfactory twelve months' service, that is, for machine shop service; foundry cranes cannot be governed by this rule, on account of the extra usage and the continual dust. However, there is no other interpretation of the shop rule, which states, each or any cable inspected and discovered with broken wire in strand must be immediately discarded and new cable applied, irrespective of what length of service damaged cable has been in use.

As previously stated, cables on general service cranes (excepting foundries) should have a predetermined renewal date set, according to the number of days or hours crane is in use, always taking into consideration the nature of the material handled, for although cables may not show weakness in broken strand wires, the breaking strain may be very materially reduced, with too continued service.

Crane Operators and Slings

The present practice, where one or more carrier cranes are in continuous use, is to provide a competent slinger, who takes the responsibility of slinging all material to be handled, and in seeing that all material is placed in the proper position. Rules applying to crane operators and slingers are for eliminating any misunderstanding. 1st.—Crane operator being responsible for material load when hoisted, that there is no undue swing to load, and that observance is made to clear projecting wall cranes, etc. 2nd.—That crane operator takes his signals from slinger with respect to hoisting, lowering, or carrying of ma-



A ONE, TWO, THREE AND FOUR LEG SET OF CHAINS

terial. 3rd.—That crane operator can refuse to make load lift, if in his estimation improper fastenings or under capacity slings or chains are used by slinger. 4th.—Slinger to be fully competent in the use and capacity selection of chains which are at his disposal and generally indicated for their special use. 5th.—That in handling or placing material in a predetermined position for mechanics involved, all signals must be transmitted through the slinger to the crane operator, for too many signal bosses will tend to create accidents and cause unnecessary confusion. Cordial co-operation is demanded from crane operator and slinger, and where repeated friction is apparent in the handling of material, a change is effected.

Chains

In the accompanying sketch are shown a set of one, two, three and four leg chains, and these are considered as the most serviceable for all round use in foundry, machine and erecting shop service, not excepting the endless chain sling. These chain lengths are made up of No. 1 best tested, oval link, wrought iron, for hoisting purposes, covering a lifted range from 1-4 to 20 tons, as illustrated. This is in reference to general shop use, as there are a large variety of special chains for work of specific character. With reference to the head ring on these chains they are made a relative size for the different chains, to facilitate hooking on to the carrier crane main hook. Ring thickness is made to suit the chain capacity. Chain data is omitted in this article, as this information may be had from any of the hand-books now available. The safety factor used for hoisting chains approximates 5 to 7, that is, 1-5 to 1-7 the breaking strain of chain being the allowable carrying load.

It is freely conceded that the one and two leg hook chains, and also the endless sling chain, are the most expedient and desirable for handling material in erecting, foundry and structural work. The two, three and four leg chains, with different width hooks, are the best adapted for boiler and tank plate work. The three leg chain is recognized as the safest flat plate carrier on account of its three point suspension, thereby decreasing the possibility of plate slipping.

Rope Slings

Manila or hemp rope slings are not included in the shop equipment for general sling work, on account of being subject to strand cutting when used on rough or sharp edged material, yet their field of usefulness is so extensive that it is almost essential to provide such slings for specific uses. The 1-inch and 1¼-inch rope slings (endless) are much preferred by erecting millwrights. Light material that is being installed down from large or heavily constructed machinery, necessarily requires a light sling, and where small parts are being handled in a confined space, with the probability of being jammed, the rope is more suitable, as it enables the operator to watch any crowding of the work against adjoining machinery. Light ¼-inch chain slings, where a heavy power crane is doing the work, will not stand up to this momentary strain, and frequently results in a bursted link and falling of material. Rope slings are very serviceable when placing light material inside of locomotive boilers, where view is obstructed.

Tube handling in large quantities give preference to the 2 and 2½-inch diameter endless rope sling, as it has a natural tendency to hug the tubes securely and preventing slipping, and in the case of thin tubes, avoiding damage to the same.

The Endless Chain Sling

This chain, in ¼ and 5/16 inch open link sizes, ranging from 3 to 5 feet in length, is regarded by machine shop operators as one of the most necessary individual pieces of equipment of any they have got. These chains are used with wall cranes equipped with air hoists or quick-acting chain blocks as lifting mediums, the average weight of material handled being from 100 to 1,000 lbs. Mechanics making daily use of such chains carry their work out in routine manner, so that little thought is given to the possibility of chain breaking and causing injury. The need of regular inspection is therefore obvious. The following is a conversation the writer had recently with a workman using a chain as cited above.

"Where is your chain sling?" Machine operator produces the same. "How long have you been using this chain?" "Possibly five months." "Have you ever examined the individual links in the chain for possible defects?" "Well to be candid—No. I did not." "Don't you think that it would only be fair to yourself to give your chain a two-minute inspection once a week and thereby save yourself from possible injury?" "Well, I know you are right, as I have never given it a thought. I am going to take a squint at that chain right now, for now that I think about it I have made that little old chain do some work this while back." This is not to cast reflection on the ability or carelessness of these men, who just simply acquire a familiarity with their working surroundings and forget to be concerned in matters not dealing directly with the work. To make it a plainer statement, these men are more mindful to the material held in the sling than to the sling itself, which for the common needs of safety, in seeing that chains are kept in good condition.

Chain Inspection

Inspection of chains requires that an inspector becomes acquainted with the following duties. To inspect daily the condition of chains in the different departments, checking up those that show wear or abuse. Single leg chains checked up for undue stretch by their known length. Two, three or four leg chains are checked up by taking notice, when suspended on crane hook, that no one leg exceeds others in length. Care should be taken in making these chains that all sections are of equal length from the ring head. Where hard usage has caused noticeable dents or bent links, it is necessary that the chain be discarded and a new one applied; the long links as shown in A and B constitute the only part of chain allowed for smith-shop welding. The welding of any other link in chain leg is prohibited as further assurance of safety, not that there should be distrust of the welded link renewal but the general insecurity of other parts of the broken chain which may be strained. By renewing the entire chain leg there is no doubtful action taken.

Chain Identification

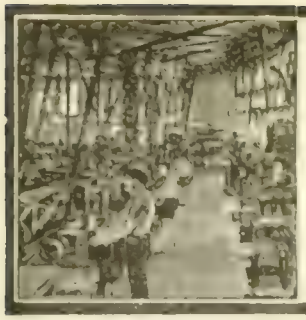
It is part of the chain inspector's duty to know exactly how many chains, and type, are in daily use. This requires that each chain have an identification number stamped on it, this to enable inspector to keep record of their use or abuse. Record of the same to be kept in card index or log book. This identification to read as follows: Number of chain, 50; kind of chain, double (plate hook); length and size, 6 ft. 0 in. x ⅝ link; where used, plate department; when made, 1—8—1918; last annealed, 3—6—1920; remarks, O.K.

Annealing Chains

The advisable practice is to anneal all chains semi-annually, especially those that are being used in continual and heavy service, as these develop a tendency to become crystallized. The method for this annealing is to put chains in a series of rows on the bed of the annealing furnace, one that is oil fired being preferred. With furnace closed up, gradually apply heat until chains attain a cherry red. Shut off the heat and allow furnace to cool until chains can be removed by hand. The inspector is then called upon to examine chains carefully, link by link, as this annealing invariably shows up seam fractures, that are indiscernible when chains are in use and oil coated. Chains inspected and found O.K. are then oiled. Large chains are brush painted, and the smaller chains dipped in oil tank and then allowed to drain off. They are then returned to their various departments for service.

◆

A locomotive turn table, 92 feet long, was recently lifted and moved horizontally 1,600 ft. at Kansas in ten hours by means of a 100-ton wrecking crane and two railway flat trucks. The crane first lifted one end of the turn table and a cribbing was built underneath at about two-thirds of its length from the crane. The crane was then lowered away. This action raised the far end and a cribwork was built there. The crane gave another hoist and the first crib was heightened. By repeating this process the turn table was raised high enough to admit the trucks below far more quickly than could have been done with jacks. Once on the trucks the table was easily hauled by a locomotive to its new site.



DEVELOPMENTS IN SHOP EQUIPMENT

UTILITY SCREW PRESS

Carl Pletz & Sons, 717 Sycamore St., Cincinnati, Ohio, have placed on the [illegible] what is known as their No. 3 and No. 3½ utility screw presses. The illustration depicts the press, and, as stated, it is made in two sizes. This type machine is used to straighten shafts, bars, rails, beams, etc. It is also arranged to press in or out bushing, press gears or wheels on and off shafts and can form or bend metal in many shapes.

The bed is 4 ft. long, deep and heavily ribbed with a hole cored under the screw to permit work to drop through to the floor when pressed out. These cored holes permit the pressing of pieces in or off of long shafts. The two upright posts are strong enough to withstand ten times the load that can ever be applied.

The screw is made of high grade steel accurately chased. The steel screw pad fits on the end of the screw and the thrust is taken on a hardened steel and bronze washer, which is set in oil.

The hand wheel on the end of the screw is fitted with a handle so that the screw can be returned quickly. By using a four-foot bar in the hand wheel a pressure of about 20 tons can be secured. Following are the principal specifications:

	No. 3	No. 3½
Size of screw	2"	2"
Pitch of screw	¼"	¼"
Distance between posts	12¾"	17¾"
Distance under screw pad	14"	20"
Length over all	4'	4'
Height with screw down	42"	42"
Weight	500 lbs.	600 lbs.

SHAPER MILLING ATTACHMENT

The Tri-State Milling Machine Co., 172-174 South Front Street, Memphis, Tenn., have placed on the market a milling machine attachment for use on shapers. This attachment is shown on the photograph, and the makers claim that this fixture is good for the following uses.

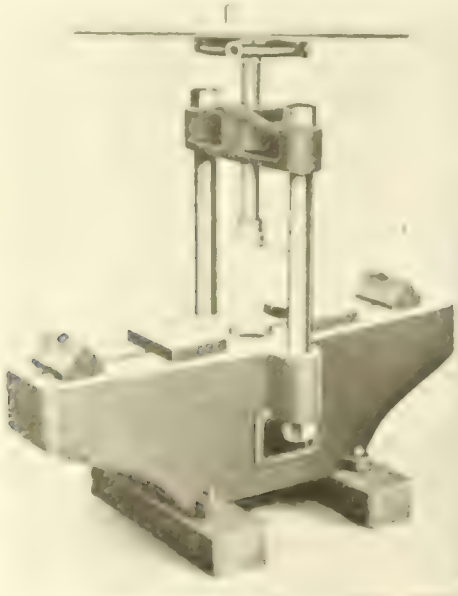
The attachments are made to fit any size or make of shaper, and in very short order the shaper is transformed into a miller by use of this fixture. The attachment is used to cut spur gears up to 18 inches diameter, also bevel and mitre gears, worm gears, keyseating shafts almost any size with one cut, woodruff keyseating, plain slab milling and form milling such as forming and shaping up dies and punches, profile work such as milling out circular slots, fluting reamers, taps, or similar work. This is said to be a powerful attachment because it is worm driven by a triple cut worm and gear, running in a closed gear box filled with heavy oil, which lubricates every bearing from the inside of the gear box; all bearings are taper and provided with a lock nut, one on the inside and one on the outside for taking up the wear.

Following are the principal specifications: Milling head—Cast iron, heavily constructed, fitted for ram slide and fastened with gib key. Pulley—four step cone, 4, 6, 8 and 10 inch, 2½ inch face. Bearings—bronze, taper adjustable for wear. Drive—worm and gear, hardened steel, runs in oil. Drive shaft—nickel steel, hardened steel thrust bearings on each side of worm. Runs either right or left. Spindle—Hollow high carbon steel; 1⅞ inch diameter. No. 4 standard Morse taper. Nose threaded for chuck. Arbor—Nickel steel, 1 inch diameter. Only one furnished. Table—3 feet long, 3 T-slots, round base permitting turn at any angle, cross feed 7 inches. Table fits on shaper base, giving quick adjustment.

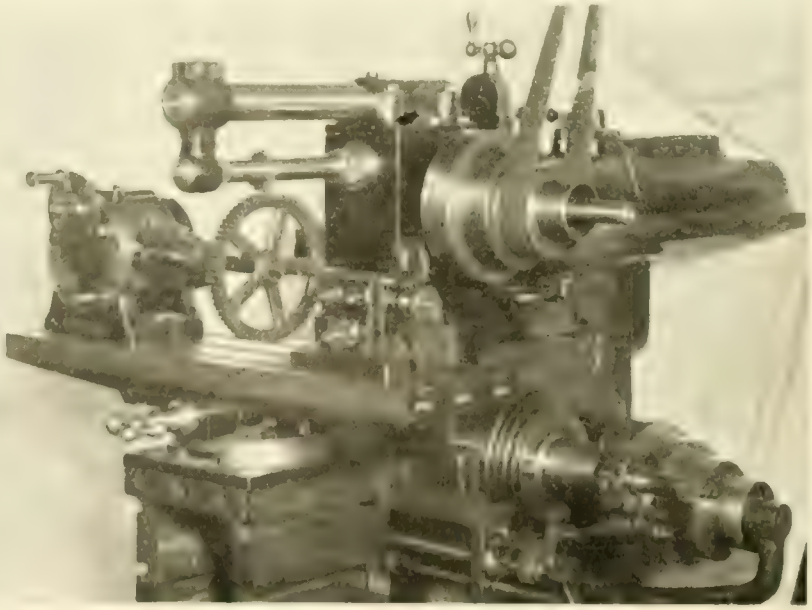
FRICTIONLESS CENTRE

The Snellex Manufacturing Co., Rochester, N.Y., have placed on the market what they claim is a frictionless centre.

This centre is designed to eliminate friction between the work and the centre, to make it unnecessary to regrind centres, to increase production at a



[illegible] SCREW PRESS

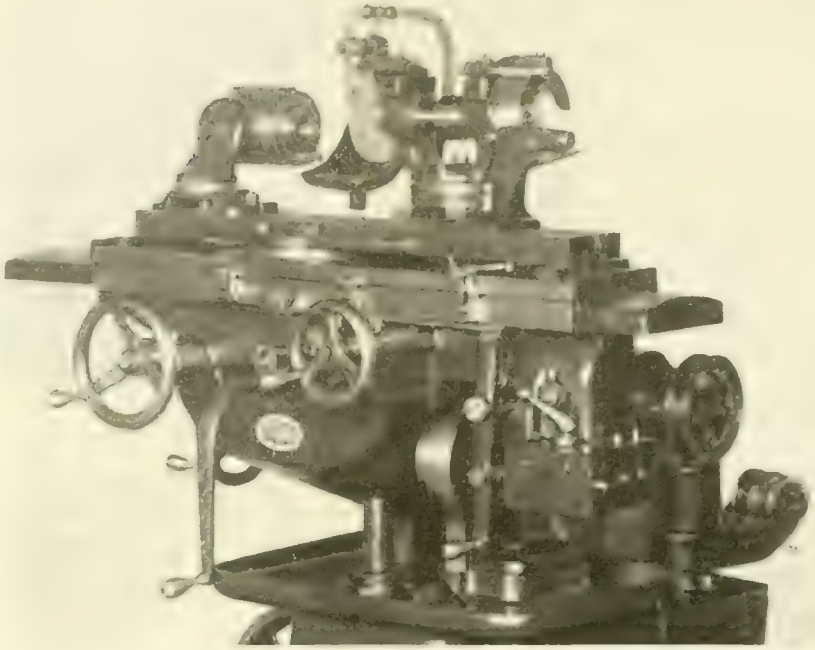


SHAPER MILLING ATTACHMENT

higher speed, and to prevent worn or burnt centre holes in the work. It is also said to do away with the unsatisfactory lubrication between centre and work. The arrangement of the ball-bearings and the general construction is plainly seen in the accompanying sectional view.

The live centre is mounted in special ball bearings, at the rear end of the centre is an adjustable cone, together with a lock washer and check nut, and the end is sealed with an oil cap. The principal point of novelty lies in the construction of the ball races, which are the peculiar movement of the balls, formed at an angle of forty-five degrees.

This arrangement has the following advantages. It insures the greatest sensibility of the live centre without end or side play, and a permanent trueness of the balls to one ten-thousandth of an inch. This last feature has its secret in which are travelling in a spiral motion caused by the forty-five degree angle of the races. This insures a perfect and uniform wear of the balls which keeps them round and true in size. These centres are made in four sizes, varying from No. 1 to No. 4 Morse taper.



GENERAL VIEW OF THE GRINDER

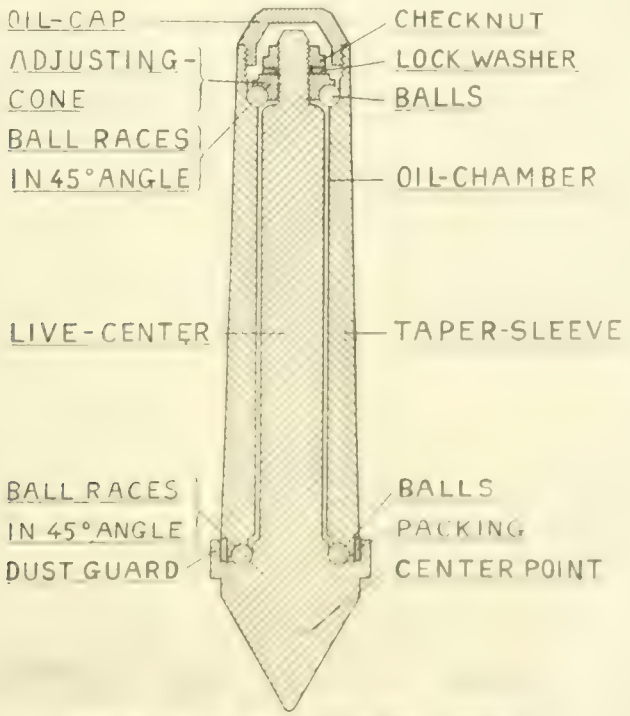
UNIVERSAL TOOL ROOM GRINDER

The Oakley Machine Tool Co., Cincinnati, Ohio, have placed on the market their No. 3 universal tool room grinder. This machine has incorporated in it certain features intended to insure, during the life of the machine and under all working conditions, accuracy, rigidity, and convenience of control. The longitudinal feed may either be hand-operated or driven by power. The fast hand feed is operated through a rack and pinion, either from the front or rear of the machine by a long hand-lever. A small handwheel in front of the saddle controls the slow hand-feeding movement. The power feed is driven by a single belt from a countershaft, and constant belt tension is maintained irrespective of the position of the knee. There are three feed changes obtained through a cone pulley.

The operating and reverse levers are directly under the operator's hand. Hardened chrome-nickel steel is used for all reverse mechanism clutches. The cross-feed is operated by a large diameter handwheel, either from the front or rear of the machine, and there are micrometer dials at both ends of the cross-feed screw. Another large handwheel is used for the vertical feed, which has a micrometer dial on the elevating shaft. The thrust is taken by ball bearings.

The slide of the machine is aligned to the saddle by vee and flat bearings of liberal dimensions. This slide is designed to maintain true alignment during the life of the machine, and it is easily removed from the saddle for cleaning. The saddle and knee have V-bearings; and in the case of the slide, saddle, and knee there are no gibs or adjustments for the operator to tamper with. The entire slide bearings are oiled through one centralized oil-cup. The wheel-head swivels on the column 180 degrees either side of the central position. The wheel-spindle runs in dustproof, taper, bronze bearings. The work-head has a No. 12 B. & S. taper for receiving the shanks of large end-mills. This work-head swivels in horizontal and vertical planes.

The range of the machine is as follows: Longitudinal movement, 17 inches; vertical movement, 10½ inches; cross movement, 9 inches; maximum swing, 10 inches; maximum distance between centers, 20 inches. The table surface is 5¾ inches wide, and 33¾ inches long. The [illegible] feeds are 6½ inches, 11⅝ inches, and 19⅝ inches per minute.



SECTION VIEW OF FRICTIONLESS CENTRE

CONTINUOUS FEED DISK GRINDER

The Gardner Machine Co., Beloit, Wis., have recently placed on the market what is known as their continuous feed disk grinder. This machine is semi-automatic in operation and is designed to eliminate the usual amount of

labor expended in operating hand disk grinders. An important feature of this machine is the constant production obtained. With any hand operated machine, the human element has to be considered and naturally a uniform output cannot be obtained.

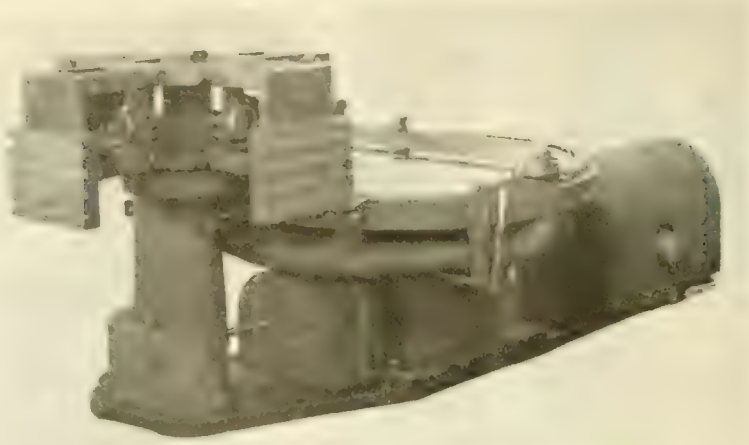
The machine carries a horizontal disk wheel 53" in diameter, and is provided with a revolving reel, which carries four work tables, as shown in illustration.

The work to be ground is attached to these tables by means of suitable fixtures mounted on them, and the revolving reel brings it over the surface of the grinding wheel. The tables are automatically lowered on the wheel. Pressure to insure quick removal of stock is secured through gravity, or by the means of a compression spring this pressure may be adjusted. The weight of the table insures application of uniform pressure, which can be increased by adding extra weight if the character of the work necessitates it. A micrometer stop screw makes it possible to remove stock to definite dimensions.

Due to the construction just described, the operator simply places the work in the fixture and removes it when finished. The revolving reel is mounted on a vertical shaft 3½ inches in diameter, and is driven through worm, spur, and bevel gears from the gear driving the main spindle of the machine. By means of change-gears, the reel may be made to revolve ¼, ½ or 1 revolution per minute, thereby producing 1, 2, or 4 finished pieces per minute. Other speeds may be obtained by substituting special gears.

The driving shaft is provided with a friction clutch which is operated by a lever placed in a convenient position, which makes it possible to start or stop the feeding mechanism independently of the grinding wheel. The reel and the shaft which drives it are mounted in bronze bearings; all other shafts are carried in ball bearings. The gears are totally enclosed, which protects them from dust and dirt and allows them to be amply lubricated. The feeding stand is bolted directly to the baseplate upon which the machine is mounted, and to accommodate various sizes of work, has an adjustment of 6 inches along this baseplate. Because the work-tables are at right angles to the grinding heel, accuracy of the work being grouped is assured.

Rigidity and strength are important features of this machine. It weighs about 7,600 pounds when crated for domestic shipment. The disk wheel is mounted on an extra large and heavy cast-iron flange. The driving spindle is of large diameter and runs in two self-aligning radial ball bearings. All thrust of the wheel is taken on a self-aligning ball thrust bearing which contains ten 1¼-inch diameter balls. Power is transmitted to the disk wheel by [illegible] bevel gears. The ratio between the driving shaft gear and the spindle pinion is 2.4 to 1. These gears are also fully enclosed within the base of the machine, and provision is made for ample lubrication. They are completely protected from any grit or dust.



GENERAL VIEW OF THE CONTINUOUS FEED DISC GRINDER

An extra pulley is mounted on the driving shaft for belting to an exhaust fan, which is set on the floor in back of machine. There is a dust channel cast into the base of the machine extending entirely around and underneath the outer edge of the disk wheel. When the guard ring is removed this channel is uncovered all the way around so that the grindings which might interfere with effective exhausting may be removed readily. A dust exhaust manifold is fastened into the bottom of this dust channel in four places and connected to an extra large exhauster, reducing the dust problem to a minimum. The cast-iron guard ring is fastened to the top of the base with collar head screws. Any portion of the guard ring is removable, permitting the grinding of work carrying a lug projecting above the plane of the ground surface.

NEW THINGS IN MACHINE TOOLS

PORTABLE AIR COMPRESSOR

The Black and Decker Manufacturing Company of Baltimore, Md., are now making a portable electric air compressor outfit mounted on a three-wheel carriage fitted with a pushing handle and brake. Automatic control of the supply is provided for as the machine starts to operate when the pressure falls to 160 lbs. and stops when the pressure has been raised to 200 lbs. per sq. in. A reducing valve is fitted to the reservoir to give a working pressure of from 40 to 80 lbs. The regular equipment includes valves, gages, electric cord, 25 feet of air hose and blow gun. Additional equipment may be supplied if desired.

MOTOR-DRIVEN TOOL GRINDER

The United States Tool Company of Cincinnati are now making a self-contained tool grinding machine operated by a 5 h.p. shunt-wound, adjustable speed Westinghouse motor running at from 1120 to 1600 r.p.m. The motor is fitted direct to the drive shaft and may be started or stopped by pushing a button, the starter being located in the base of the machine. The control buttons are located on the top of the machine so as to eliminate the possibility of the workmen striking it while operating on the work.

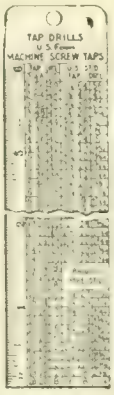
MULTIPLE-SPINDLE DRILL HEAD

A new design of adjustable-center multiple-spindle drill head has recently been placed on the market by the United States Drill Head Company of Cincinnati. When using six spindles or less, the full adjustability of the head may be obtained, although more than six spindles may be applied but with a lesser range of adjustment. Each spindle is carried on a separate auxiliary arm that may be swung in a complete circle about an intermediate pinion that meshes with the main gear in the central drive spindle. The intermediate pinions are made with a wide face to permit of vertical adjustment to the separate spindles when it is desired to use drills of different lengths. One locking nut is used for holding the spindles in position and any of the spindles may be readily attached or removed. The auxiliary spindles are fitted with ball thrust bearings and are provided with means for adjustment for wear. Five standard sizes are made with a range for drilling on circles from 2 inches to 18 inches in diameter. Special sizes may be had if required.

Have You Tried This Contest Yet? If not--- Do so Now

Do you want to win one of these scales?

It's very easy, and at the same time you add to your store of knowledge. The details are given below.



The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

The Prize Winner for Dec. 9th Issue is GEORGE LAND, 567 Patterson St., Peterboro, Ont. Another chap from Welland had his answers correct, but was 7 days later than the winner in sending them in.

CONTEST FOR JAN. 6TH ISSUE

Contestants are required to write us, stating to which advertisements we refer in this number.

1—Something you can't afford to take chances on.
2—How to prevent a certain article from freezing.
3—Something that is solid yet adjustable.
4—How to eliminate the danger of error.
5—Something that you can accomplish in three minutes.
6—How to reduce non-productive time.
7—How to save money.
8—How to obtain dependable production.
9—Something said to be very popular.
10—How to get away from experimenting.
11—How to get more speed.
12—How to make one pound of one material equal ten pounds of another.

These are Correct Answers for List from Dec. 9th Issue:

1—John Bertram & Sons, Ltd.
2—The Wallace Barnes Co.
3—The Galt Machine Screw Co.
4—The City of St. Johns.
5—Dominion Forge & Stamping Co., Ltd.
6—The Bristol Co.
7—Gooley & Edlund, Inc.
8—Nova Scotia Steel & Coal Co., Ltd.
9—Puro Sanitary Drinking Fountain Co.
10—Hoyt Metal Co.
11—A. R. Williams Machinery Co.
12—Norton Company of Canada.

Closing Date for This Contest is January 27th

Machine Tool Designers Were Busy in 1920

Automatic Turning Machine, Boring Mill, Pneumatic Motor Hoists, Electric Riveting Machine, Blasting Machine, Keyseating Machine, Twist Drill Grinder, and Other Tools Are Included

The Oliver Machinery Company, Grand Rapids, Mich. —An improved patternmakers' and general woodworker's vise. The vise is patented and is very versatile in its adaptation to the general line of work found in woodworking departments.

Manning Maxwell & Moore, Inc., New York.—A special vise in which three jaws can be swivelled independently, and can be locked in any desired position.

Alfred Herbert, Ltd., Coventry, Eng.—This concern has brought out various new developments, but perhaps the three most distinctive are as follows: An automatic turning machine in which there is no overhead gear. The range of speed is obtained automatically, and a new method is used to move the turret. A patent cold sawing machine. This machine has a patent chip remover which greatly reduces the risk of saw breakage and permits of higher speeds and feeds. A radial drilling machine. This machine is just entering on the market and was recently shewn at the Olympia Exhibition in London.

A. T. Brush Tool Co., Erie, Pa.—A micrometer that can be used for measuring from zero to two inches without any attachment. The spindle has a screw of 220 threads per inch, while a separate screw with forty threads per inch is used for traversing the spindle.

National Acme Co., Cleveland, Ohio.—An automatic machine constructed on the multiple spindle principle. This machine has a capacity of from 3 to 4 inches.

The Wetmore Reamer Co., Milwaukee, Wis.—A special set of reamer tools designed for the production of round, straight, and thoroughly smooth holes in small cylinders.

The Storm Manufacturing Co., Minneapolis, Minn.—A boring mill that is especially adapted for the boring or reboring of motor cylinders and other parts such as large gears, heavy bushings, tractor wheels, etc.

Independent Pneumatic Tool Co., Chicago, Ill.—Various developments have been brought out, these including pneumatic motor hoists, a moisture separator, a power screw driver attachment, a pistol grip electric drill, a hose coupling and a drill repair vise.

The Kent Machine Co., Kent, Ohio.—A compound mixture for mixing bone meal and various compounds for pack hardening and carburizing steel.

The Cincinnati Electrical Tool Co., Cincinnati, Ohio.—A combination bench drilling stand that has a portable electric hand drill attached.

Mada Engineering Co., Liverpool, Eng.—An electric riveting machine which is portable in nature and can be used on various jobs.

H. B. Underwood Corporation Philadelphia, Pa. — A small engine that may be operated either by steam or air for driving portable mechanism such as boring bars and drilling machines. These engines are made in two sizes, one or three horse power.

Long & Allstatter, Hamilton, Ohio. An improved design of flask fastening of the rocker cam lock type.

The Victor Tool Comp., Waynesboro, Pa. A collapsible taper cutting pipe tap. Sizes of these taps range from ¾ to 6 inches.

The Gray Machine Tool Co., Buffalo.—A blasting machine that is adapted for the cleaning of the insides of pistons.

The Bear Pneumatic Tool Co., Kansas City, Mo. A pneumatic riveter that is supported on a stand, and is intended for use in riveting traction plates on the rims of pneumatic tires. With slight modification, it can be adapted to a great variety of work.

Grimscom-Russell Co., New York.—A multiwhirl oil cooler that is used for the cooling of oil in turbine bearings, reduction gears, or quenching oil used in heat treatment.

Ackland Specialty Co., Springfield, Mass.—A screw driver which it is claimed will remove any rusted screw which could not be budged by an ordinary driver.

The Baird Pneumatic Tool Co., Kansas City.—An arch flue and pipe bender that is adapted for bending into difficult shapes, locomotive or marine arch flues, also airtight connections used under regular freight or passenger cars.

The Mattison Machine Works, Rockford, Ill. — An automatic stroke belt sander. This machine automatically moves the sand belt across the surface.

Hercules Manufacturing Co., Portland, Oregon. — A horizontal key seating machine in which the work holding face plate is secured to one end of the machine, and may be tilted to accommodate pieces with tapered keyways.

The R. S. Whitney Co., Lewiston, Maine. — A safety repair jack which is designed to meet all classes of car, truck, and tractor repair work.

Carl Pletz & Sons, Cincinnati, Ohio. — A screw press that is adapted for the straightening of shafts, bending bars or shapes, pressing in bushings, etc.

Universal Boring Machine Co., Hudson, Mass. — A special lubrication system has been arranged for on all machines turned out by this company.

The National Engineering Co., Sarnia, Ont. — A line of tool stands, racks, and stools especially adapted for all types of manufacturing plants.

The Aetna Foundry and Machine Co., Warren, Ohio. —A machine designed for use in tinning heavy sheets used in the manufacture of milk can bodies.

The Logansport Machine Co., Logansport.—A new line of air chucks with duplex control mechanism.

The Superior Collett Chuck Company, Grand Rapids. —A new type of collett chuck for drilling machines.

The Eastern Tube & Tool Co., Brooklyn, N.Y. — A new line of machine centre points made of high speed steel for insertion in any mild steel shank.

The Ryerson-Conradson Co., Chicago, Ill. — A vertical attachment of the semi-universal type. This attachment can be fitted to the ways of the millers. A universal dividing head is also part of their new developments.

Square D. Co., Detroit.—A lever safety attachment for side presses. This device is arranged to protect the hands of the operator. The press throws a clutch which brings down a shield, thus protecting the operator.

Canadian Desmond Stephan Mfg. Co., Hamilton. This concern produces a full line of emery wheel dressing tools. They also handle industrial diamonds.

Bellevue Industrial Furnace Co., Detroit, Mich. — A semi-automatic twist drill grinder which is arranged for two, three, and four-lip right and left hand drills.

The Standard Meter Co., Ltd., Toronto, Can. — Two different types of coal oil lamps that are used for brazing and other kindred jobs. These lamps are said to be both wind and rain proof.

Augustine-Bacon Manufacturing Co., Kansas City, Mo. —A reversible driving chuck that is said to grip the stock when running in either direction.

D. E. Dunham, Los Angeles, Cal. —A valve grinder is so arranged that a valve face can be ground accurately, even should the valve centre be mutilated.

J. H. Williams & Co., Brooklyn, N. Y.—A new line of

Falcon wrench that has a wide range of applications and is particularly adapted for piping installation.

S. P. Rockwell, Syracuse, N.Y.— Hardness tester. Machine consists of cast frame and plunger. A vertical, movable chuck holds the piece to be tested. Piece to be tested is raised until coming in contact with testing point.

The Ingersoll-Rand Co., Sherbrooke, Que. — Several new tools have been added to their pneumatic lines, these to be known as "Little David" tools.

The Lovejoy Tool Co., Inc., Springfield, Vt.—A new line of turret tool holders.

The Graphoscope Development Co., New York. — A moving picture apparatus especially designed for the use of salesmen.

The U. S. Tool Co., Newark, N.J.—A line of subpresses for various classes of stamped work.

The Westinghouse Electric and Mfg. Co., Philadelphia, Pa.—An electric welding outfit which is mounted on a portable truck.

The Automatic Transportation Co., Buffalo, N.Y.— A lifting and tiering truck. This truck will pick up and elevate loads to any desired height up to 6 ft.

The Hamilton Tool Co., Hamilton, Canada.—A combination chuck and collet. A patented tool that is designed for use in the rapid interchange of drills, reamers, counterbores, etc., on any machine without stopping the machine. The chuck is fitted with Morse taper shank to fit the machine spindle.

The James Buckley Co., Montreal, Que.—A new type of tool holder, known as the both way tool holder. This holder is said to be especially for planers or shapers.

The Climax Company, Montreal, Que. — A line of belt fasteners, belt lacing machines, and packing. The fasteners are of wire construction and can be laced into the belt either by machine or with a simple hammering tool. The packing is used in extremes of temperatures or pressure such as are sometimes experienced in refrigeration work or rods of pumps of every description. It is claimed that this packing never burns, and does not harden or crystallize.

Daniel C. Reid, Philadelphia, Pa. — An ellipsograph. This instrument is claimed to draw all kinds of ellipses and ovals, from 1½ inches up to 12 inches major axis.

The Joseph T. Ryerson & Son, Chicago, Ill. — A line of wire nail machines.

The Sutherland Machine Shops, Omaha.—A cylinder and boring machine. This small machine will fit on the bed of any lathe, from 14-inch to 24-inch swing, and can be used on either open head or closed cylinder blocks.

M. H. Derringer, Philadelphia, Pa.—A special tool holder for lathe use.

The Link Belt Co., Chicago, Ill.—A safety mechanical overload release which is especially adaptable for elevating, conveying, and power transmission machinery.

The D. & M. Guard Co., Rochester, N.Y.—A safety guard used on any type of punch press.

The Wahlstrom Tool Co., Brooklyn, N.Y.—An automatic tapping attachment which is claimed to speed hand tapping. Steel gears provide an oscillating movement, the backward movement clearing the chips. No springs are used, the movement being absolutely mechanical.

The Berg Burner Co., Brooklyn, N.Y.—A new design of burner for the burning of oxo-hydrogen gas, automatically produced from oil and water. The burner will operate in any position, and is designed to consume cheap distillates or refined oils.

The Kent Machine Co., Kent, Ohio. A semi-automatic two-spindle pointer. This machine is used for pointing bolts and rods up to three-quarter in. diameter.

The Cincinnati Ball Crank Co., Cincinnati, Ohio.—A compression coupling for use on shafts between 15 16ths, and 3 inches.

J. Merey, Chicago, Ill.—A marking machine known as a stampograph. This is a rotary machine for lettering and numbering and can be used on any soft metal.

Guldager and Jantch Co., Detroit, Mich.—A device for the holding of indicators when used on large square with a blade from 2 to 3 inch in width.

The W. S. Rockwell Co., New York.—A new line of ship yard angle and plate heating furnaces. Angle heating furnaces are of double end construction, permitting the charging and heating of the material from both ends. Plate heating furnaces have doors of exceptional weight and capacity, and to facilitate opening and closing, are mechanically operated. These furnaces are generally built for oil or gas fuel, although coal may be used if desired.

The Canadian Hauck Burner Co., Port Hope, Canada.—A combination lead melting furnace and portable oil burner. When used as a melting furnace 200 lbs of lead or babbit can be melted in 15 min. When not used for melting lead in the pot, the burner may be detached from the furnace, and used for melting babbit out of bearings, re-babbitting, bending pipes, etc.

The National Acme Co., Cleveland, Ohio.—A bar pointing machine which meets the requirements of manufacturers in general. Any shaped bars can be handled in this machine and in some cases where quantities of stock are handled, two machines operating end to end are used. A one-horse power motor drives this machine and may be connected to any convenient electrical circuit.

The Kremer Cummins Machine Co., Cleveland, Ohio.—A mechanical belt shifter for machine cone pulleys. No part of the shifter is applied directly to the machine or to countershaft. In operating the device, the operator first shifts belt to the next smallest step of cone pulley by operating handles.

The Dominion Welding Mfg. Co., Montreal.—An instantaneous water heater combining various features. The burner of this heater is of special type. Those heaters are made for both the trade and domestic use.

The Gammons-Holman Co., Manchester, Conn. — A spiral fluted taper reamer that may be used in drilling machines. These reamers are made in all standard sizes.

The Peerless Machine Co., Rachine, Wis.—A drill rack that provides for the placing of drills with their points downward, the holes in this stand being drilled cleared through, each having two diameters.

The H. H. Moore Co., Rochester, N.Y.—A slotting attachment that can be used on planer or shaper. Will make internal shaping of any description, such as dies, jigs, gauges, keyways, etc. The attachment is made in three sizes.

The Hunter Saw and Machine Co., Pittsburgh, Pa.—A special tooth adjustment for inserted tooth saw blades. The arrangement permits the adjustment of one or more teeth independent of the others.

The Manhattan Machine and Tool Works, Grand Rapids, Mich. — A four-point screw press that is operated by a special rachet action. The capacity of this press is 80 tons.

The Wallace Supplies Mfg. Co., Chicago, Ill.—A machine for the bending of cold bars to any desired shape. The machine will also bend various sizes of pipes.

The Beard Pneumatic Tool Co., Kansas City. A Staybolt cutter that is said to have a strength capable of clipping off staybolts up to 1¼ diameter at the rate of 1 200 per hour.

The Eclipse Counter-Bore Co., Ltd., Walkerville, Ont. A full line of reamers, pilots, core drills, countersinks, counter bores, cutters, and special tools.

The Roberts Mfg. Co., New Haven, Conn.—A line of unit jacks and bolt couplers. A surface gauge connection is arranged to work in conjunction with these jacks.

The Brown Instrument Co., Philadelphia, Pa. A new compensated heatmeter. This instrument embodies various new features.

Edward A. Robinson Co., Montreal.—An automatic grease cup which when once filled and pressure is applied, the feeding process is constantly maintained until all grease has been delivered to the bearing.

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PRINCIPAL CONTENTS

Selling and Cutting Prices

THE Montreal Daily "Star," in a recent edition, makes use of the words: "It must be remembered, too, that lower prices will stimulate buying." It may be that this referred only to certain lines of merchandise that pass over the counter. It could not refer to selling in general, because the facts are against any such theory having a chance to prove correct.

Start back with the automobile business, the first to put up the price reduction sign. Ford started the business, and in a few weeks car makers, all over the country, irrespective of what their cost sheets told them, were quoting new selling prices. Some orders came in as a result, but it was dealer business, and the ultimate buyer has not come into the market yet as a result of the price reduction. The dealer is loaded up with cars, but the cutting of the price of automobiles did nothing at all toward promoting real, genuine sales to car users. If it had [illegible] all Ford's [illegible] plant would not now be standing idle in Detroit with the workers clamoring for the use of that plant in order that they might make cars for their own use.

Neither could the "Star's" statement be applied with truth to the great field of machine tools, where investments run into very large amounts. When a man goes out to buy machinery he does so because he is going to produce something with that machinery. He does not buy because [illegible]. The "Star" would not put in a new press to-day or a new battery of linotypes because there was a cut rate on. They would put these things in only on one condition, viz., that they had need of them.

The steel market is another case. Prices have been reduced, and yet buying is less. Non-ferrous metals have been lower [illegible] and yet to-day they are a drug on the market. Low prices will not sell them.

The "Star's" claim that lower prices stimulate buying should be interpreted in very narrow confines. In some lines of foodstuffs and wearing apparel this may be true, but in the great field of iron, steel, machine tools and equipment in general, it has very little significance.

Making Income Reports

ACCORDING to reliable information, a number of small shops, some of them in the machinery business, have neglected to make out their reports for the purpose of the income department assessment.

The general excuse is that they do not consider they have a business large enough to make them liable for purposes of the income tax, and therefore they send in no report.

The safest way is to make out the report in full and let the department do the thinking as to whether or not the proprietor is liable to taxation.

Write off a fair amount for depreciation, not more than you are entitled to and not more than you can substantiate in fact if you are called upon to do so.

This paper discussed the matter with the proprietor of a small machine shop, who stated that making out the income tax report was the best piece of business he had ever undertaken: "It gave me an idea of my own affairs that I never secured in any other way. Before I was taking too much for granted, and it was a surprise to learn that some departments that I thought were my best money-makers were not far removed from being cripples. It made me a great deal more keen on collections and on making every department toe the mark. It was a good day for me when I started making out my reports."

This advice is intended, of course, for the smaller plants, for as a rule, the larger concerns have a system that takes care of all these matters.

Remember, the onus for making the returns is placed upon the individual. Do not imagine that you can sit back and wait for the Government authorities to come around and dig you out.

In December 30 issue we published three pages of brief items regarding machine tool developments. The two pages to follow are a few more that Canadian Machinery has covered during the past year. The tools included are of the miscellaneous type.

Canadian Machinery takes this opportunity of thanking its many friends who forwarded Christmas and New Year's messages during the holiday season. Never before has there been such rare taste in the selection of suitable cards and designs for the sending of holiday greetings. The work, from a technical point, was splendid, and the friends of Machinery are to be congratulated upon patronizing the best print shops in the country, for in no other place could such work be turned out. We thank all heartily who have so remembered our publication.

Right at the start of the New Year would be a good time to start some serious study—get headed in one direction. Get on the job and go ahead. The man who does things well will be employed while the tinker is around waiting for something to turn up.

The cost of living in Canada was 163 per cent. above 1913 in May of 1920. At December first this had come down 15 per cent. And every decline means that our dollar is getting to look more like a real, respectable, honest-to-goodness dollar should look.

Take Advantage of This Situation

MR. MANUFACTURER: Just a word or so with you.

You are not particularly busy at the plant this month. It may be that part of the works are closed down, and you are not sure when they will reopen.

It may be that you are running part time and trying to make the availbale work spread over as far as possible in the interests of your employees.

However, all that does not make much difference. Here is the point:

Was everything all right in the shop when it was running full blast a few months ago? Were there any operations that you had in mind to make inquiries about?

Were there some pieces where the cost sheets showed that it was taking more time and more money to produce in your plant than in others?

Were there not some old machines on the line that had served their day and generation? They had been written off in depreciation some years ago, and still you hammered away with those old plugs, always saying that just as soon as things let up a bit you intended to replace them with something more in keeping with the rest of your outfit. Yes, that's all true. Well now—

Why not take all these matters up with your machine tool dealer now when he has a chance to talk seriously with you, and to give you the service that he could never do were he busy with orders and shipments. The truth is he has time now to give some real attention to your case.

By real attention we do not mean a hurried visit with a grip under his arm and some blue prints, circulars and order forms chucked in his pocket.

We mean this: Ask the engineering department of any good machine tool firm to show you where improvements could be made in your method of production.

Don't let the dealers get away from you too easy. They have often told you that they had machines that would pay you to put in your plant. You were making money then, perhaps, and you were not interested. Most men, when they see the returns coming along all right, are not inclined to worry much about some little old machine that is kind of run down at the heels. It is working, and the results are coming, so there it ends.

But these dealers have told you they could show results that would save money for you?

They have taken blue prints of your work, perhaps, and submitted figures showing just what could be done. But you were busy then and the thing didn't have a chance to get across.

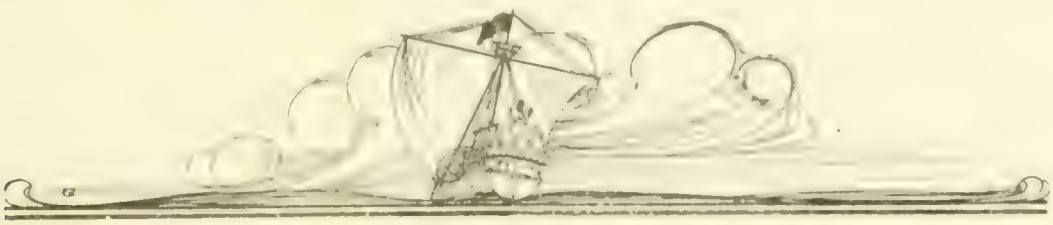
Your plant is not going to be idle long. It is going to start and run again soon, perhaps overtime as well as regular days. You are going to meet stiff competition—harder in many lines than you have ever met in the past.

Your big chance is going to be in having equipment just as good—perhaps a little better—than any other firm in your line of business. Certainly you cannot afford to take a chance in entering into competition with the world with a second-rate equipment. Don't depend on tariffs and adverse exchange rates to keep out foreign-made goods. Get your plant in such shape that your costs will be on a competitive basis with the best of them.

Now remember—machine tool firms have the time to attend to you now, and, what's more, they are in the mood to do it. Get them to show you where they can save money for you with their equipment. If they can put up a good money-saving proposition to you, you are going to be interested. If you are not, then your place is not in the manufacturing business in this day and generation.

Take advantage of the fact that it is a buyers' market. Make use of the service the machine-tool builders have at their disposal for a technical analysis of your manufacturing problems.

Right now is a remarkably good time to take a look over your whole equipment and weed out the weak spots.



MARKET DEVELOPMENTS

Believe The Worst Has Happened in Market

Any Change Now Should be for the Better—Change is Being Made in Pig Iron—Other Prices Stay Much the Same—Buyers Not Coming Into the Markets at Any of the Centres

THE year 1921 starts off quiet in the machine tool, iron and steel markets. Dealers are not expecting a renewal of buying at once, but a number of them will go as far as saying that conditions are not getting any worse, and from this they reason that the peak of the trouble has been reached. Cancellations have been asked for in a number of instances, but the majority of these have not been granted.

One Canadian mill has started one of its bar mills in operation this week. This will roll largely for stock. Buffalo mills are in here making a strong bid for bar iron material just now, and the Canadian mill is called upon to meet this competition. Sheets are selling in fairly large quantities, but the best business just now is being done in tubes.

The Corporation mills continue to roll steel at about [illegible] per cent of their capacity, while many of the independents are idle. Pittsburgh reports have many guesses regarding the matter of wages, the one carrying most weight being that wages might be cut right now by some of the independents were they not afraid that a reduction in wages would lead to a demand on the part of the buyers for cheaper steel.

New York reports that machine tool makers are not bulging yet in regard to their selling schedule for 1921. Makers probably realize that in the present temper of the market a reduction in price would not bring in any new business. Dealers in this district agree that this is the case, holding that when machine tools are wanted, they are bought almost regardless of any reduction in price.

The scrap metal trade continues in the slump. It has been there for many weeks now and little trade is being done. The larger yards persist in their attitude not to buy anything except enough to cover their contracts.

QUIET OF HOLIDAY SEASON IS STILL IN MONTREAL MARKET

Special to CANADIAN MACHINERY.

MONTREAL, Que., Jan. 6.—Industrial adjustment in the nature of wages and working conditions, promises to be a feature throughout the coming weeks. It is not that industry [illegible] a bad year financially, but rather that high wages must be diluted in some degree to conform to the new analysis required to maintain well balanced trading throughout the coming [illegible] years. In establishing this new industrial formula it is essential that the component ingredients be carefully selected and arranged before doses in large volume can be administered, nor when in a condition for regular and advanced treatment, the convalescent period of invalid industry will be shared to be the case of greater or [illegible] in every line of manufacture.

Looking for Summer Activity

The coming of the new year has not [illegible] any new element of interest in steel circles, apart from the fact that [illegible] are far from being over-done by the existing quiet character of general business. The great bulk of steel demand [illegible] for [illegible] and [illegible] so that consumers are not overstocked with supplies of any kind. Most of the mills are operating light so that surplus stocks are not over-abundant. This condition promises well for an early return to normal activity when the trade and the public generally feel that the hour has arrived for geting back into working harness. "The past year has been filled with many interesting features, and while the latter months have caused us some anxiety, we have never been discouraged, realizing that some such depression must come sooner or later before trading could be returned to a sound working basis, a condition that has not existed since the middle of 1914." "The intervening years," continued the dealer," have passed by with conditions more or less of an artificial nature, intermixed with excessive demand and abnormal price fluctuations, but never with the assurance of permanency, either in the way of production or in the cost of materials. It is necessary, therefore that the irregularities of industry, liquidation or mutual adjustment of high priced goods, better regulation of wage scales and working conditions, should be arranged to suit the changing circumstances. We are now carrying sufficient supplies in warehouse to meet all requirements of the trade, but are not overloading ourselves, for the reason that the present lull is prevalent throughout the country, and that all activity is more or less in repose." It would appear that dealers are not expecting any heavy buying before March at the earliest, but many are anticipating a fairly active period before the summer months are far advanced. All price quotations are of a nominal character and unchanged. Further revision downward is not unlikely.

Tool Trade Very Quiet

The machinery trade seems to be facing a period of comparatively light buying, as a result of the unsettled state of trade, and the tendency on the part of many manufacturers to curtail operations while industry is adjusting itself to its changing surroundings. Purchasing agents, in many cases, are instructed to buy conservatively during this period of transition, and in consequence it is often difficult to secure their business interest, let alone an order for equipment. Many, however, intimate that their normal needs are under-supplied, and a renewal of general activity would mean additional or renewed equipment.

More than ordinary attention has been given recently to the clearing out of existing stock, which, in many instances, was acquired at higher figures than could be obtained for similar tools at the present time. Some dealers are fortunate in having small stocks on hand, while others are carrying considerable equipment purchased during the past year or two, much of which, however, was secured in bulk, so that a lot of it could be sacrificed and still leave the dealer with a small profit. The holiday weeks provided a quiet period for many dealers and the volume of business was comparatively low for most houses, some of which had their men off the road for the entire week.

Active Period May Follow Lull

"We may as well be out of business for all we are doing just now. However, we must take the rough with the smooth, and as the past several years have enabled us to weather a short period of depression, we are content to carry on at a slight loss, in the expectation that the year will not be far advanced before things begin to right themselves. For the present prices may as well remain where they are, although a revision would result in lower quotations." This statement from a dealer here indicates the extent of trade in old materials, but the passiveness is counteracted by the belief that business will show a gradual picking up after a few more weeks of slow trading.

POINTS IN WEEK'S MARKETING NOTES

There is no change in the scrap metal situation, yards still reporting little being done in any line. Many of them are still out of the market for any non-ferrous lines.

A new price on pig iron is being brought out, which will show a reduction.

Buffalo firms are making a bid for the bar iron trade in this district. Another bar iron mill was put in operation by the Steel Co. of Canada this week.

Tubes continue in good demand, but the price remains unchanged.

The Steel Corporation mills continue to operate at 92 per cent. of capacity, while most of the independents are down.

Machine tool dealers in the district have no intimation of new prices by the makers.

Pittsburg claims that some of the steel mills would cut wages, but fear such a move would lead to a demand on the part of consumers for cheaper steel.

QUIET WEEK IN TORONTO TRADE

No Intimation Given of Intention to Make Reductions in the Selling Schedules

TORONTO.—Although it is generally anticipated that trade will improve soon, it is hardly to be expected that a change would be felt in the first few business days of the year. Trade is quiet in nearly all lines, and buying for the most part is confined to actual wants. If a firm can do without a machine tool or an order of steel, it is being done without, and it might also be added that in some cases if they can do without paying promptly for anything or everything they secure they are following the same policy.

Dealers say they have no intimation of any change in selling schedules on which to work this year. It might have been expected that new prices would have come out around the first of the year. It is reported that some of the makers have still on hand fairly large stocks of raw materials, and they feel that until they have worked these out they should not make any material reduction in prices. It is also doubtful whether there would be any advantage from a reduction in price at this time. As a general thing, when a man buys a machine tool he does so because he has some definite purpose in view—he is going to make something, and the matter of a few hundred in price would neither drive him from the market nor bring him into it.

There are some inquiries in the market now. They are, for the most part, rather small, and consist of replacements or minor additions to existing plants.

Small tools are selling also on the hand-to-mouth policy, and the whole territory is being worked for all available business. There are few firms carrying any very large supplies of small tools, and the low rate of operations in many cases justifies this position, and offers no good reason why a firm should change its attitude.

The Steel Market

Bar Iron.—There is a fairly heavy stock of bar iron in the warehouses of this district. Buying is not very brisk yet, but mills are working putting in stock for the buying they expect to come later on. Steel Co. of Canada started a bar mill running this week, which has been down for some time past. The mills at Buffalo are making a strong bid to get into this district, and they are offering prices at times that make it very plain they are out to secure business. The Canadian firms, therefore, are under the necessity of meeting this competition. Bars are quoted for prompt delivery from stocks at 4.75c per pound.

Sheets.—The demand for sheets has continued fairly strong this season, and the weather has helped in this to some extent. The open season has the effect of allowing outside work to go ahead. Stocks held at present are fair, but were a buying movement of any size to start, the merchants would soon have to come into the market in order to secure supplies. The one sheet mill in this district is fairly well supplied with orders, which should keep it in operation for a couple of months yet.

Plate.—Demand very light at present, and has been for some weeks owing largely to falling off in shipbuilding in this district. Warehouses are quoting 5.50 to 6c, and delivery can be made on short order.

Tubes.—There is a good trade being done in tubes. The price is still holding the same, and remains well above the pre-war list. It is about the last item to show real strength, and so far is the hold-out of the market in the matter of reduction.

AS A WHOLE 1920 WAS A GOOD YEAR FOR U.S. MACHINE TOOL TRADE

Special to CANADIAN MACHINERY

NEW YORK, [illegible] — The year just closed has been a very profitable one for the machine-tool industry of the United States notwithstanding the unsettled conditions of the past few months. In the first half of the year [illegible] period of activity in buying started about the middle of 1919 and continued almost without interruption until May or June, 1920. In April the railroad strike occurred and later there was the coal strike, both of which created a shortage of steel material and made it impossible for most plants to work at full capacity. Coincident with these factors were the [illegible] of high-priced pig iron, steel, castings and other machine-tool parts. If they [illegible] middle of 1920, though there was also a [illegible] end of September, taking into account [illegible] At the beginning of 1920 [illegible] [illegible] of money. As a result, the [illegible] of unfilled orders [illegible]

financial condition, despite the large profits which they have made in the last few years. One plant is said to have $1,000,000 in capital tied up in such raw or partly finished material. It becomes a serious problem just how to meet the evident expectations of buyers of lower prices on tools. With few exceptions, machine-tool manufacturers have not made reductions, but fear that they will be obliged to do so within the next 30 or 60 days. One engine lathe manufacturer announced a 12½ per cent. cut, effective January 1, but, generally, the builders are still holding out for the same prices as have prevailed throughout the greater part of 1920. An occasional concession is heard of, particularly when dealers are competing for business. Such concessions usually come out of the dealer's commissions.

Some business is expected to develop during the first two or three months of the new year, but it is not likely that there will be any rapid recovery in buying. In some quarters it is thought that most all of 1921 will be quiet as compared with the business that was done in 1919 and 1920. There is a considerable amount of dormant business—that is, the inquiries have been sent out in recent weeks, but buying has been postponed. Whether a goodly share of this prospective buying will materialize remains to be seen.

MAY HAVE TO MAKE MORE PRICE CHANGES TO CONVINCE BUYERS

Special to CANADIAN MACHINERY.

PITTSBURGH, January 6.—Mills that closed in the latter part of December are not resuming this week to any great extent. Resumption hinges upon the accumulation of orders, whether strictly new business, specifications against old contracts or releases from suspensions, and the accumulation has been very slow. A change in conditions is requisite to enable the independents to operate at any considerable rate, and while such change has been predicted in most quarters as likely to occur after January 1, the change can hardly be expected in the first few days of the new year.

As to the United States Steel Corporation, it continues to operate up to the physical limit, and with a few additional blast furnaces blown in during the past two months, on account of supplies of coal and coke being improved, the corporation's operations are somewhat heavier than for many months, at about 92 per cent. of capacity, measured in steel making units in operation.

With the corporation operating at 92 per cent., there is an ingot production at the rate of fully 21,000,000 tons a year, and at an estimate of 20 per cent. for the independents, counting, of course, those that are closed entirely, there is 6,000,000 tons more, making 27,000,000 tons altogether, there is production at about 65 per cent. of the 42,000,000 ton average rate obtaining during the first nine months of 1920, when the demand for steel was regarded as remarkably heavy. Considering the stagnation prevailing [illegible] that consumption of steel had [illegible] by more than one-third. If so, the prospect for the immediate future is not heavier production, but lighter production. It would be necessary to account for the present production, and [illegible]

Prospects for Consumption

[illegible] the ultimate consumer will take hold. It is not a question directly of when the fabricating shops, car shops, machinery manufacturers, bolt, rivet and nut makers, spike manufacturers, agricultural implement makers, producers of cold finished steel bars, and the various other "manufacturing consumers" will decide to buy steel from the mills, but a question when the customers of these steel consumers will themselves be disposed to buy. The manufacturing consumers will buy only as they see a market for their various finished products.

The readjustment the country is now undergoing is of course chiefly a readjustment in prices for materials and services. Consequently it is not enough for mill prices of rolled steel products to be readjusted. There must be readjustment in prices all along the line down to the ultimate consumer. Assuming for the sake of argument that mill prices have been readjusted adequately, it is a fact that prices of manufactured goods have not in all cases been readjusted in keeping. The manufacturing consumer cannot stand between the steel mill and the public and put in his own pocket the reduction the steel mill makes. To illustrate, at the top of the last price movement before the war, culminating late in 1912, steel bars reached 1.40c, while standard railroad spikes reached 1.85c. Merchant bars, as now equalized between the Steel Corporation and independents, are 2.35c, which is 67 per cent. advance. Assuming for argument that this extra price is justifiable, there is the condition that when, recently, spikes declined to 3.65c, they were regarded as readjusted, but they are 97 per cent. above the 1.85c price. If the spike makers cannot "afford" to sell at less than 3.65c, then there is something wrong with their costs and the country will wait until they have readjusted those costs.

Pipe Gets in Line

The year 1920 in the finished steel market ended nicely by the independent market on steel pipe coming down on the last day, for under date of December 31, 1920, the Republic Iron & Steel Company issued a new card showing the same discounts as in the Industrial Board schedule of March 21, 1919, the card to which the United States Steel Corporation has uniformly adhered all this time. The other independents will necessarily have to do likewise and it is an unimportant detail what dates their revised cards may carry. The reduction is from a basing discount, on ¾ to 3-inch, of 54 per cent. to a basing discount of 57½ per cent., making $7 a net ton change.

Pipe was the remaining item in the regular steel mill products to be adjusted. The independent price on tin plate came down to the Steel Corporation price of $7 per base box, 100-pound, about the middle of November. On November 26 bars, shapes and plates came down to the Steel Corporation or Industrial Board prices of 2.35c, 2.45c, and 2.65c, respectively. November 29 wire and nails came down to 3.25c for wire and $3.25 for nails, and a few days later sheets came down to 3.55c for blue annealed, 4.35c for black and 5.70c for galvanized.

Thus the whole round trip of independent steel prices was made just within the limits of the calendar year 1920. It is true that late in 1919 the independents in certain lines were quite generally securing prices above the Steel Corporation or Industrial Board prices, but those prices could be regarded simply as containing delivery premiums, the mills not being willing to sell and the buyers not being willing to buy for any distance ahead. It was after Chairman Gary of the Steel Corporation made his statement, December 30, 1919, that the corporation would not advance its prices, that the independents saw that they would really have to "go it alone" and then they regarded their advance prices as regular prices, not as premium or temporary prices.

Prospective Steel Prices

In view of the fact that there is not likely to be any general buying movement in steel products in the near future, say not earlier than three months hence, steel manufacturers would prefer it to be assumed that present prices represent the prospective bottom, but the fact may as well be stated plainly that this is not the more likely prospect. The balance of probabilities is that the low point in steel prices, on which the market will eventually turn and from which it will stiffen, will be lower than the present level, say from 2.00c to 2.20c for bars, shapes and plates. If such prices come, they will not be developed soon. There is no incentive for a mill to name such close prices unless, or until, it sees an opportunity to fill up fairly well and thus obtain an economical operation.

As to wages, reductions by independents' mills have not been proceeding nearly as fast as seemed likely two or

three weeks ago. The majority of independents are holding off, awaiting a further reduction in the cost of living and also being desirous that the present plant idleness may have its full moral effect both upon workmen and the retail stores they patronize. Some mills, too, attach much importance to the theory that immediately upon wage reductions being made steel buyers would expect lower prices for steel.

At the opening of business this week a large valley pig iron producer announced its willingness to sell basic iron at $30 and Bessemer iron at $32, valley, thus recording declines of $3 in each grade from the previous nominal quotations. Foundry iron, formerly quotable at $35, valley, is not plainly marked at any price, but will have to readjust itself to no more than a moderate spread above basic.

EDMONTON STANDS AT GATE OF NEW COUNTRY AWAY TO NORTH

A. M. FRITH, secretary of the Edmonton Board of Trade, writing to this paper of conditions in that centre during 1920, says:—

Commercial development in Edmonton during 1920 has been very pronounced. In addition to a considerable number of new firms, which have been established in the city, both manufacturing and distributing, many important additions have been made to plants and warehouses already established.

One of these is the erection of a nine storey warehouse for Marshall Wells, Alberta, Ltd., this building being the largest warehouse devoted to one line in western Canada, outside of Winnipeg. It is expected that the building will be ready for occupancy about December 1st. It will be one of the most complete and best equipped buildings of its kind in the country.

Work has also been started on an addition to the already large warehouse of Revillon Wholesale, Ltd. The plans for this building will make it, when completed, the largest commercial warehouse in the Dominion, with 11 acres of floor space, a frontage of 350 feet by 150 feet in depth, nine storeys high. Another important development is the erection of a new factory for the North West Biscuit Company at a cost of $500,000. This company is already the second largest exclusive biscuit factory in Canada and the new building will have double the capacity of that at present occupied.

Perhaps the most important development in the commercial life of Edmonton during the year has been the acquisition by lease of the Edmonton, Dunvegan and British Columbia Railway by the C.P.R. The inevitable result of this will be a very greatly improved service to the Peace River and Grande Prairie countries, followed by a great influx of settlers and business men to that fertile region of which Edmonton is the natural distributing centre. A great number of new settlers have gone into the Peace River country this year, and from present prospects this number will be very materially increased in 1921. Enquiries regarding Peace River are coming from all parts of the United States and the Old Country and no less than 2,000 soldier settlers have been located on farms in that district during the last few months. It is a fact that by far the greatest number of soldier settlers have taken up land in Alberta, this Province leading by a big margin all the other Provinces in Canada. Over $13,000,000 has been authorized by the local office of the Soldiers' Settlement Board for advances to soldiers, for the purchase of land, livestock or farm machinery.

Another important factor in the commercial development of Edmonton is the extensive work being conducted by many strong companies in the oil fields of Northern Alberta. Chief among these is the Imperial Oil Company, the Union Oil Company and some syndicates financed by British capital. The operations of the former have resulted in the discovery of oil at Fort Norman on the Mackenzie River. Oil was discovered at a depth of about 600 feet and further drilling will be done in that vicinity next spring, those in charge of the work being convinced that oil will, within a short time, be found in large quantities. In view of the urgent need of petroleum and its vital place in industry at the present time, the particular significance of this discovery and the operations leading to the development of further oil deposits will be apparent.

Edmonton, however, will depend in the future, as it has in the past, very largely upon the development of the rich agricultural land in Central and Northern Alberta. Greater attention is being given all the time to the possibilities for wealth in mixed farming in this district. This is seen in the steadily increasing value of farm lands and the growing demand, particularly on the part of Americans from the bordering States, for improved farms in this territory. During the year a large number of American farmers, most of them with an ample supply of capital, have purchased improved farms and from the enquiries which are being received it is evident that this number will be very greatly increased.

With the timber resources of this Province practically untouched, with one-seventh of the total known coal deposits of the world within its borders and the consequent possibility of an unlimited supply of cheap power, it seems inevitable that an extensive industrial community will be established by which the markets of the western Provinces will be supplied from this city or district.

In view of all these developments, therefore, it must be stated that the future prospects for Edmonton have never been better than they are at the present time, and business men with one accord are extremely optimistic in respect to prospects for greatly increased business during 1921.

CANADA NINE DAYS AWAY FROM JAPAN

Believes Trade Could Be Developed That Would Be to the Interest of Dominion

A summary of an article in a recent edition of the Trade Bulletin from Ottawa, gives the following:

Canada's place in the future development of Japan should be studied. Many things are in our favor. We are the nearest of all western nations to Japan. Vancouver is to-day nine days from Yokohama and San Francisco is 20. This is due largely to the excellence of Canadian ocean service. Canada must put herself more firmly on the business map. A better cable service and a national news service is necessary.

Japan is developing very rapidly and her needs are many. In Japan it is the age of building. Many of the roads of Japan are execrable, but the growth of interprovincial transportation has brought forward the subject of state developed trunk roads, and it is even now under consideration. Herein lie openings for Canadian road-making machinery, and timbers, and later for the increased importation of bicycles, automobiles and accessories. In the renewing of the Japanese cities, there is market for Canadian steel and iron, for nails and bolts, iron pipes and wire, and all wood and iron working machinery. Agricultural implements will be in demand, for the wages in the cities will inevitably drain the cheap labor from the rural districts.

Hopeful for 1921.—The annual travelers' convention of the Ontario Wind Engine & Pump Company, Toronto, manufacturers of Toronto farm equipment, was held at the head office of the company. Every traveller felt optimistic concerning business in 1921. Many thought that the volume of sales would exceed [illegible] over from the buying of luxuries to the buying of necessities, and it was predicted that spring will bring healthy buying; also the farmers were figuring on planting a large acreage in 1921.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$39 96
Lake Superior, charcoal, Chicago	53 50
Standard low phos., Philadelphia	44 79
Bessemer, Pittsburgh	41 96
Basic, Valley furnace	37 50
Toronto price:—	
Silicon, 2.25% to 2.75%	51 50
No. 2 Foundry, 1.75 to 2.25%	50 00

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 75
Steel bars, base, Toronto	4 75
Iron bars, base, Montreal	4 50
Steel bars, base, Montreal	4 50
Reinforcing bars, base	5 50
Steel hoops	6 00
Tire steel	5 00
Spring steel	8 00
Band steel, No. 10 gauge and 3-16 in. base	5 50
Chequered floor plate, 3-16 in.	8 50
Chequered floor plate, ¼ in.	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	3 00-4 00
Tank plates, Pittsburgh	3 50
Structural shapes, Pittsburgh	3 00
Steel hoops, Pittsburgh	3 50-3 75
F.O.B., Toronto Warehouse	
Small shapes	5 50
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 67 to 5 50
Small shapes under 3"	3 62

FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points	C.L.	L.C.L.
Montreal	58½	73
St. John, N.B.	84½	106½
Halifax	86	108
Toronto	38	54
Guelph	38	54
London	38	54
Windsor	35	50½

METALS

	Gross Montreal	Gross Toronto
Lake Copper	$19 00	$19 50
Electric copper	18 50	19 00
Casting copper	18 00	19 00
Tin	44 00	45 00
Spelter	8 50	9 00
Lead	7 50	8 00
Antimony	8 00	9 00
Aluminum	34 00	35 00

Prices per 100 lbs.

PLATES

Plates, 3-16 in.	$ 5 50
Plates, ¼ in.	5 50

PIPE—WROUGHT

Standard Buttweld Pipe

	Steel Blk.	Steel Galv.	Wrought Iron Blk.	Wrought Iron Galv.
⅛	$ 4 45	$ 5 15	$.....	$.....
¼	5 81	7 41	6 91	8 61
⅜	5 81	7 41	6 91	8 61
½	7 16	9 61	7 66	9 48
¾	9 88	13 81	9 43	12 01
1	14 61	18 97	14 71	17 37
1¼	17 60	21 74	19 90	24 01
1½	21 04	25 99	23 79	28 74
2	28 31	34 97	32 01	38 67
2½	44 75	55 28	....	....
3	58 52	72 29	....	....
3½	74 06	90 62	....	....
4	87 75	107 37	....	....

Standard Lapweld Pipe
Per 100 Ft.

	Steel Blk.	Steel Galv.	Gen. Wrought Iron Blk.	Gen. Wrought Iron Galv.
2	$32 01	$ 38 67	$35 71	$42 37
2½	48 26	58 79	54 11	64 64
3	63 11	76 88	70 76	84 53
3½	75 90	92 46	85 10	101 66
4	89 93	107 55	100 83	120 45
4½	1 05	1 29	1 30	1 54
5	1 22	1 50	1 52	1 80
6	1 58	1 95	1 97	2 33
7	2 06	2 53	2 53	3 01
8L	2 16	2 66	2 66	3 16
8	2 49	3 07	3 07	3 64
9	2 98	3 67	3 67	4 36
10L	2 77	3 41	3 41	4 05
10	3 56	4 39	4 39	5 21

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger, 50%.
4" and under, running thread, 30%.
Standard couplings, 4-in. and under, 30%.
Do., 4½-in. and larger, 10%.

OLD MATERIAL

Dealers' Average Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$10 50	$10 50
Copper, crucible	13 00	12 00
Copper, heavy	12 50	12 00
Copper wire	12 50	12 00
No. 1 machine composition	13 00	12 00
New brass cuttings	7 00	9 00
Red brass turnings	10 00	10 00
Yellow brass turnings	7 00	7 50
Light brass	5 00	5 00
Medium brass	6 50	6 00
Scrap zinc	5 00	5 50
Heavy lead	5 25	5 60
Tea lead	2 50	3 00
Aluminum	16 00	16 00

	Per Ton	Gross
Boiler plate	$11 00	$12 00
Heavy melting steel	18 00	23 00
Axles (wrought iron)	25 00	20 00
Rails (scrap)	18 00	18 00
Malleable scrap	20 00	25 00
No. 1 machine cast iron	32 00	33 00
Pipe, wrought	8 50	10 00
Car wheel	30 00	33 00
Steel axles	20 00	20 00
Mach. shop turnings	8 00	9 00
Stove plate	23 00	25 00
Cast boring	8 00	12 00

BOLTS, NUTS AND SCREWS

	Per Cent
Carriage bolts, 7-16 and up	+10
Carriage bolts, ⅜-in. and less	Net
Coach and lag screws	15
Stove bolts	55
Wrought washers	25
Excavator bolts	+10
Machine bolts, 7-16 and over	+10
Machine bolts, ⅜-in. and less	+10
Blank bolts	Net
Bolt ends	Net
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	+25
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square, blank	+25 add $2 00
Nuts, square, tapped	add 2 25
Nuts, hex., blank	add 2 50
Nuts, hex., tapped	add 3 00
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent
Set screws —20% 25 and	5
Sq. and hex. hd. cap screws	12½
Rd. and fil. hd. cap screws	plus 25
Flat but. hd. cap screws	plus 50
Fin. and semi-fin. nuts up to 1-in.	12½
Fin. and Semi-fin. nuts, over 1 in., up to 1½-in.	—5
Fin. and Semi-fin. nuts over 1½ in., up to 2-in.	+12½
Studs	+5
Taper pins	—12½
Coupling bolts	+40
Planer head bolts, without fillet, list	+45
Planer head bolts, with fillet, list plus 10 and	+55
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	+60
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add +85
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

Per gross ton

Bessemer billets	$60 00
Open-hearth billets	60 00
O.H. sheet bars	76 00
Forging billets	56 00-75 00
Wire rods	52 00-70 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails, base	$5 75
Cut nails, base	6 50
Miscellaneous wire nails	50%

ROPE AND PACKINGS

Plumbers' oakum, per lb.	0 10¼
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 29
British Manila rope	0 28
New Zealand hemp	0 23

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net

MISCELLANEOUS

Solder, strictly	$ 0 27½
Solder, guaranteed	0 29½
Soldering coppers, lb.	0 62½
White lead, pure, cwt.	20 35
Red dry lead, 100-lb. kegs, per cwt.	15 00
Gasoline, per gal., bulk	0 42
Pure turp., single bbls., gal.	3 15
Linseed oil, raw, single bbls.	2 37
Linseed oil, boiled, single bbls.	2 40
Wood alcohol, per gal.	4 00
Whiting, plain, per 100 lbs.	3 00

CARBON DRILLS AND REAMERS

S.S. drills, wire size	40 and 5
Can. carbon cutters, plus	10
Standard drills, all sizes	40 and 5
3-fluted drills, plus	10
Jobbers' and letter sizes	40 and 5
Bit stock	50
Ratchet drills	10
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	25 off
Drills and countersinks	net
Bridge reamers, carbon	50
Centre reamers	5
Chucking reamers	net
Hand reamers	10
High speed drills, list net to plus	20
Can. high speed cutters, net to plus	10
American	plus 40

COLD ROLLED STEEL

[At warehouse]

Rounds and squares	$7.50 base
Hexagons and flats	7.50 base

IRON PIPE FITTINGS

	Black	Galv.
Class A	70	85
Class B	30	40
Class C	20	30

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 8 50	$ 9 00
Sheets, blue ann., No. 10	7 00	7 50
Canada plates, dull, 52 sheets	13 00	13 00
Can. plates, all bright	14 00	.....
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	13 00	.....
Fleur-de-Lis, 28 B.W.G.	12 50	.....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28, U.S.	10 00	11 00
Premier, 10¾-oz.	10 50	11 40
Zinc sheets	16 50	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 50	.....
1½ in.	31 50	29 50
1¾ in.	31 50	30 00
2 in.	35 00	30 00
2¼ in.	35 00	29 00
2½ in.	42 00	37 00
3 in.	50 00	48 00
3¼ in.	.. ..	48 50
3½ in.	63 00	51 50
4 in.	85 00	65 50

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	28
Palacine	31
Machine oil, per gal.	58
Black oil, per gal.	27
Cylinder oil, Capital	1.01
Petroleum fuel oil, bbls., net	19

BELTING—No 1 OAK TANNED

Extra heavy, single and double	6½
Standard	6½
Cut leather lacing, No. 1	2 00
Leather in side	2 40 3 00

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	$4 50
Polishing wheels, bull-neck	2 00
Emery in kegs, Turkish	8¾
Pumice, ground	06
Emery glue	30
Tripoli composition	9½
Crocus composition	12
Emery composition	11
Rouge, silver	64
Rouge, powder, nickel	38

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ⅛ in. to 1 in. rod	0 30
Brass sheets, 24 gauge and heavier, base	0 38
Brass tubing, seamless	0 42
Copper tubing, seamless	0 44

WASTE

XXX Extra	.23	Atlas	.19
Peerless	.22	X Empire	.18½
Grand	.21½	Ideal	.18
Superior	.21½	X Press	.17
X L C R	.20		

Colored

Lion	.16	Popular	.12
Standard	.14	Keen	.10
No. 1	.14		

Wool Packing

Arrow	.35	Anvil	.22
Axle	.28	Anchor	.17

Washed Wipers

Select White	.20
Dark colored	.09
Mixed colored	.10

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades... 15%

ANODES

Nickel	.55 to .60
Copper	.38 to .40
Tin	.70 to .70
Zinc	.16 to .17

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$35 00	$37 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	40 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	43 00	46 00
Copper sheet, planished, 16 oz. base	47 00	50 00
Braziers', in sheets, 6 x 4 base	39 00	42 00

LEAD SHEETS

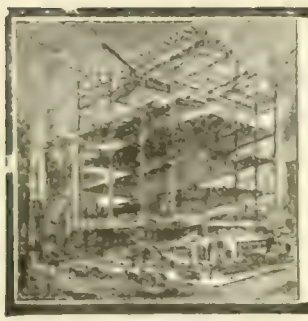
	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 50	$14 50
Sheets, 3½ lbs. sq. ft.	10 25	14 00
Sheets, 4 to 6 lbs. sq. ft.	10 00	13 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .23
Acid, hydrochloric	.04¾
Acid, nitric	.11
Acid, sulphuric	.04½
Ammonia, aqua	.15¾
Ammonium, carbonate	.23
Ammonium, chloride	.22
Ammonium hydrosulphuret	.75
Ammonium sulphate	.30
Arsenic, white	.16
Copper, carbonate, annhy	.41
Copper, sulphate	.13
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulphate	.20
Nickel carbonate	.32
Nickel sulphate	.20
Potassium sulphide (substitute)	.40
Silver Chloride (per oz.)	1.15
Silver nitrate (per oz.)	1.10
Sodium bisulphate	.13
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.39
Sodium hyposulphite per 100 lbs	9.00
Sodium phosphate	.15
Tin chloride	.30
Zinc chloride, C.P.	.30
Zinc sulphate	.08

Prices per lb. unless otherwise stated



INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES

ENGINEERING

The High School Board, Burlington, Ont., is planning the erection of a school costing $75,000.

The Electro-Foundries, whose building was destroyed by fire recently, will be rebuilt at once.

Phillips Steel & Wire Co., St. Patrick street, Montreal, are erecting a warehouse costing $7,500.

The Royal Bank of Canada are erecting a bank in the spring at Dodsland, Sask., at a cost of $10,000.

The erection of an oil-distributing warehouse is being planned by the McColl Bros., Regina, Sask.

Tenders will be called in a short time for the erection of a high school to cost $200,000 for Board of Education, London, Ont.

The Cecil Investment Co. are contemplating at an early date the erection of a $1,000,000 hotel at 22 Sparks street, Ottawa, Ont.

Plans are being prepared for a tourist hotel costing $300,000 at Kelowna, B. C. Tenders will probably be called in the spring.

A factory building will be erected on Dawes Road, Toronto, at a cost of $38,000, by Andrew Buchanan and Sons, Glasgow, Scotland.

The Farmers' Co-operative Packing Co., St. Boniface, Man., plans to erect a cold storage addition to their plant there. The estimated cost is $200,000.

A by-law will be submitted to the ratepayers early in January, authorizing construction of a memorial hospital to cost $37,000 for Perth Memorial Hospital Board.

The American firm of Steel Sash, Ltd., have established a Canadian branch at London, Ont. Machinery is being installed and manufacture will commence [illegible]

The Prov. Govt. Dept. Pub. Works, Toronto, are planning the erection of a new administration and office building, costing $1,500,000. Estimates will probably be presented at next sitting of Legislature.

Application will be made to the Parliament of Canada at the next session for an act to incorporate a company under the name of the Mackenzie Delta Petroleum Co., Ltd., with the powers incident to the production of oil and natural gas on the Mackenzie River [illegible]

SEVERAL CHANGES MADE IN THE SELLING FORCE OF JOHN MORROW CO.

THE management of John Morrow Screw & Nut Co., Limited, Ingersoll, Canada, has taken advantage of the holiday season to reorganize the company's selling force.

The company has established at 489 St. Paul street west, Montreal, an office and warehouse. This branch will be in charge of F. J. McCarty. Mr. McCarty is an experienced tool maker, and has had, in addition, a large business experience, having been intimately and favorably known to the trade of the Montreal territory for several years past. The services of Mr. McCarty and his staff will be exclusively devoted to the interests of the customers of John Morrow Screw & Nut Company, Limited, and the Ingersoll File Company, Limited, for which the Morrow Company are the sole distributors.

In Central Ontario a change has also been made. J. C. Adams, Toronto, now represents the Morrow Company in this territory. He, too, has the advantage of having had actual shop training. After leaving the bench he was for several years connected with the Vokes Hardware Co., Toronto, and since being demobilized from the Royal Air Force has been in the service of one of Canada's largest manufacturing concerns. He will devote his time exclusively to the work of the John Morrow Screw & Nut Company, Limited, and Ingersoll File Company, Limited.

H. P. Stoneman, assistant general manager, is at present in western Canada completing arrangements whereby the Morrow Company will be adequately represented on the Prairies and the Pacific Coast.

In an interview with a representative of this publication the other day, J. F. MacKay, who assumed the duties of vice-president and general manager of the company on November 1st last, stated that the Morrow Company has been running at capacity practically throughout the entire year, sales showing substantial increases over the corresponding months of the previous year.

Mr. MacKay further stated that from orders already on the company's books, and from inquiries being received daily, he was of the opinion it would be a matter of but a few weeks when the full equipment and force of the company would again be required to keep up with the demand.

In an interesting letter addressed by the company to each employee at the close of the year, the announcement is made that by means of a bonus system inaugurated one year ago the wages of every employee—excepting the executive officers—has been increased by 22½ per cent. during the year, and that the total amount so distributed was over $77,000. The same system will be continued for some time to come.

A large uptown restaurant is being planned in the vicinity of Avenue Road and Bloor St., Toronto, by Col. McLean, proprietor of the Venetian Gardens in Montreal.

Plans for the construction of a power plant on Green River next spring for the development of from 2,000 to 2,500 h.p. are being made by the Madawaska Light and Power Co., St. John, N.B.

The Billings and Spencer foundry at Welland has been closed for a readjustment of business. The notices which were posted up stated that all employees were free to seek employment elsewhere.

FINDS GERMAN GOODS NOW SELLING IN BRITISH MARKET

MR. GEORGE A. MARSHALL, of Marshall Son & Bunney, and also connected with the Canadian Association of British Manufacturers, has returned from an extended trip to England, making a survey of the steel and cutlery districts. Mr. Marshall found a good many instances where German-made goods were being sold in London in direct competition with British made.

"It is surprising the way in which German goods are coming back into the markets," said Mr. Marshall, in discussing the matter with Canadian Machinery. "Dealers tell me that when it comes to a sale and the difference of price is in favor of the German article, the sale will follow the price. Germany, according to all reports I could gather, is recovering very rapidly, and it is largely due to the efforts of the working people, whereas in England the labor market is still indifferent, to say the least. The attitude of the workers is greatly changed from the time when I was last over in 1914, and it seems impossible to get anything like the production returns of the former days, while the rate of wages is still very high. There is of course considerable unemployment, but even that does not seem to have made much difference in the rate of wages."

Living is still high in England, no matter what lines are purchased. Merchants in many cases are making much higher profits than they ever did in days before the war, and thy are fighting to retain the margin of profit.

"The war effort of the Old Country was too great for the people there to stand in many cases," is Mr. Marshall's belief. He recalled several families that had been shattered by the inroads of the war, and the remaining members, fathers and mothers in several instances, were nervous and physical wrecks, the strain having been more than they were able to bear.

Some lines of industry have found it difficult to get under way because there were such enormous stocks piled up from the days of the war, especially in lines of tool steel.

Mr. Marshall called on a number of firms whose goods he handles in Canada, [illegible] the headquarters of the Association of British Manufacturers and their agents, finding that body in a very prosperous state, [illegible] wide trade.

"But Toronto looks good to me," concluded Mr. Marshall. This paper was [illegible] to hear such an [illegible] from such a staunch Britisher, and such a lover of England. "I was really very glad to get back to Canada, and I tell you Toronto is a lovely city [illegible]

Firms Want to Establish Trade Relations With Canada

Information regarding the following lines can be obtained by communicating with this paper and mentioning key numbers:

2594, Bright Nuts and Bolts.—A Manchester firm inquires for manufacturers of bright nuts and bolts who are in a position to export. Samples and prices are requested.

2595, Colliery Rails and Tubs.—A Manchester firm are open to consider offers of colliery rails and tubs.

2596, Castings.—A Manchester firm are in the market for malleable iron and steel castings.

2597.—Gasolene Farm Engines. — A Japanese firm of agricultural implement importers in the Hokkaide are anxious to hear from Canadian manufacturers of gasolene engines. The firm is at present importing from the United States but would be glad to give preference to Canadian manufacturers. The size most is demand is 1¾ horsepower model with magneto ignition, adaptable either to gasolene or kerosene, but all sizes up to 8 or 10 horsepower are imported. Catalogues and c. i. f. prices are requested immediately.

2600, Asbestos.—A Nottingham firm are open to consider offers of fibre and sheet asbestos, washers and packings.

2601, Graphite.—A Nottingham firm would like to receive prices and samples of any Canadian graphite that may be on offer.

A memorial arch is being contemplated by the pupils and graduates of the Royal Military College, Kingston, Ont., to the memory of the many cadets and ex-cadets that fell during the war. Estimated cost, $60,000.

NUMBER OF NEW FIRMS GOT A START IN BRANTFORD IN 1920

REVIEWING the progress made in Brantford during the year 1920, W. H. Wood, managing secretary of the Chamber of Commerce states:—

During the year 1920 the following large concerns commenced production in the Brantford plants:

Robbins and Myers, of Springfield, Ohio., manufacturers of fractional horsepower motors, fans and other small electrical appliances.

J. & J. Cash, Inc., with plants in Norwalk, Conn., and Coventry, England, manufacturers of woven names.

S. C. Johnson & Sons of Racine, Wis., manufacturers of floorwax, stains, wood finishes and freeze-proof, carbon remover, cleaner, polish, etc., for automobiles.

The Wm. Sparling Co., of Toronto, Ontario, and the H. K. Ferguson Co., of Cleveland, Ohio., construction engineers, opened offices in the telephone city to care for their contracts in this part of the province.

The McClary Stove Company, of London, Ont., purchased the Wm. Buck Stove Company, and have greatly increased production in their Brantford plant.

The Williams Tool Corporation of Canada, Limited, manufacturers of pipe threading machinery, amalgamated with the J. H. Hall & Sons plant. The Williams people are from Erie, Pa., and are caring for their Canadian trade as well as that formerly held by the Hall Co., from their Brantford plant.

The Brantford Emery Wheel Co., Ltd., is now the Canadian plant of the Waltham Grinding Wheel Co., of Waltham, Mass.

The Brantford Computing Scale Co., Ltd., are now a million dollar concern, and are completing their excellent new factory, which will soon be occupied and make it possible for them to meet the demands of their business as well as to care for their new lines.

The Dominion Flour Mills, Limited, are now occupying an excellent new red pressed brick mill which was erected in the fall of 1920.

The Cockshutt Plow Co. again increased their immense plant by the addition of a large smithy.

The A. C. Spark Plug plant is completed, which, with over sixteen acres of land, has been purchased outright by the General Motors Corporation.

The Brantford Brass Foundry Company has commenced production.

The Brantford Machine & Tool Co. has been taken over by a new textile company.

Ham Brothers, manufacturers of refrigerators, bee keeper's supplies, screen [illegible]

The Blue Bird Co., manufacturers of electric washing machines, and household electrical appliances, are also securing production.

The Ontario Portland Cement Co., headquarters at Brantford, are now constructing their plant at Beachville, Ontario.

Several other industries from the United States are looking quite favorably upon the telephone city as being the centre which meets the requirements considered when seeking a location. There are now a score of United States concerns who have their Canadian plants in Brantford.

PERSONAL

George Wedlake, general manager of the Cockshutt Plow Co., Brantford, was elected mayor in the civic elections this week, having a majority and a plurality as well. The result was a remarkable tribute to the esteem in which Mr. Wedlake is held in the community. He has been on the Hydro Commission of that city for some years. Mr. Wedlake has been with the Cockshutt Plow Co. for many years, starting there as a molder, and working his way on up to the position of general manager. Mr. Wedlake has a plain and direct method of talking to men, and when he gives his word on a point it is accepted as as good as finished already. Mayor-elect Wedlake should be able to serve his city well.

A permit has been granted to the Imperial Oil, Ltd., for the erection of a steel warehouse, storage tanks and stables on the corner of Market and Water Sts., Gananoque, Ont.

Tenders Called.— Tenders are called up to January 11, for building a bridge over the Burlington Channel, Ont. The structure is to be single leaf Strauss trunnion bascule. Address R. C. Desrochers, Ottawa, from whom blue prints can be secured.

A company has been formed under the name of the British Columbia Steel Works, Ltd., by the amalgamation of the Port Moody, Eburne and Tudhope Electrical plants. Each of these plants will continue to operate on its present location, pending concentration of all of them at Port Moody.

—Darling, in Des Moines "Register."

Surely There Must be a Better Way to Gather Apples

Making Fine Tools

An Interesting Operation, Economically Performed by Means of a DUMORE Grinder

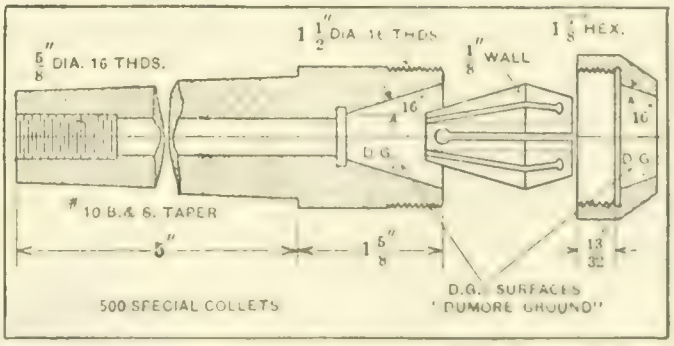
This photograph — taken at the City Engineering Company's (Dayton, Ohio) plant shows a Dumore Grinder finishing the main shank and head of a special draw-in collet. There were 500 put through in this special lot and the time for the operation shown averaged 8 minutes per piece.

The second operation; grinding the internal face of the collet nut, was also performed by this convenient precision tool.

Dumore Grinders are popular here as in every plant where fine tools are made. Their accuracy makes them useful for the finest finishing work; their simplicity and convenience make them practical for many difficult, almost inaccessible jobs.

Dumore Grinders transform any lathe into a precision grinder; they make fine finishing possible in every machine shop.

May we tell you more about them?



WISCONSIN ELECTRIC COMPANY

2931 SIXTEENTH STREET - - RACINE, WISCONSIN

DUMORE HIGH SPEED GRINDERS

If interested tear out this page and place with letters to be answered.

TRADE GOSSIP

BIG EXPENDITURE.—The Toronto Harbor Commission, at its weekly meeting had the estimates for the next year under consideration. It is proposed to spend upwards of $4,000,000 on the completion of the Sunnyside-Humber development, including the top dressings of the boulevard and bridle paths, further extension of the industrial area in Ashbridge's Marsh and the central harbor. This will provide a great deal of work for mechanics and laborers. It is intended to have a conference with the Board of Control and City Council concerning the program early in the new year. Another suggestion is that a forward movement be inaugurated for securing new industries, as there will be abundance of electrical power available if the citizens, as they probably will do, pass the bylaw for the acquisition of the Mackenzie power interests.

An ingenious plan was adopted for the removal of a waterworks standpipe about twenty feet in diameter and over a hundred feet high. It was surrounded so closely by buildings that it could not be felled like a tree and to build scaffolding would have been too costly. A circular platform was built slightly smaller than the inside of the pipe with empty barrels under it to give it sufficient buoyancy to float upon the water. The pipe was pumped full to begin with and as the work proceeded the water was drawn off. A gang of men upon the floating platform had an easy job of cutting off the pipe section by section by oxy acetylene apparatus.—Compressed Air.

A device has been invented by M. Lequex for regulating the temperature of electric furnaces. Briefly the device consists of a glass tube inclined at 30 deg. and connected at its upper end with a vessel containing a fluid which undergoes considerable dilatation under the influence of heat. The lower end of the tube connects with a vertical cylinder containing mercury in which is an adjustable piston. In the sloping tube, where the mercury enters up to a certain height, are spaced platinum contacts connected with points on the coil of a rheostat. The device is placed in the furnace, and when the latter is cold the platinum points are short-circuited by the mercury. The furnace therefore receives the full current. With a rise in temperature the liquid in the upper vessel expands and forces down the mercury, thus putting into circuit a succession of the various sections of the rheostat connected with the platinum points and diminishing the current.

It is estimated that the proposed new nurses' home at Calgary will cost $185,000. The building will be three storeys [illegible] and of fireproof construction

Explosion of an Oxygen Tank

THE accompanying engravings show some of the damage done recently by the explosion of an oxygen tank. One man was killed, a considerable number of persons were more or less seriously injured, and the property loss was large.

FIG. 1 EXPLODED TANK AND RUPTURED HEAD

The tank, which was used for storing electrolytic oxygen, was about ten feet long and four feet in diameter. The shell was made of 7/16-inch plate, laid in two courses, each five feet long, and the longitudinal (or "fore-and-aft") joints were of the triple-riveted lap type, having a calculated efficiency of about 75 per cent. The upper head of the tank was convex, and the lower head was originally concave. (This method of construction is not altogether ideal, but it is reasonably safe for ordinary purposes, when a factor of safety of at least five is used by the designer.) A safety-valve was provided and adjusted to blow off at 100 pounds pressure.

The initial rupture apparently occurred in the solid plate, the line of fracture running parallel to the length of the tank, but keeping well away from the riveted joint. The shell tore away from the head at one end, and the line of rupture also followed the girth joint at the middle of the tank, so that a considerable part of one of the sheets opened out like a leaf in a book or magazine. (See Fig. 1.) In addition to this, the lower head, which was originally concave, was ruptured along one of its diameters, and its curvature was reversed so that it was convex after the accident.

The cause of the explosion is not definitely known. In connection with the

FIG. 2 GENERAL VIEW OF THE RUINS

FIG. 3 GENERAL VIEW OF RUINS

production of electrolytic oxygen there is always a possibility of reversal of polarity occurring in the electric generator, and a consequent mixing of oxygen and hydrogen; but it is believed that this did not occur in the present case. It is far more probable, in our opinion, that the accident was due to the presence of lubricating oil in the tank. Pumps used for compressing oxygen are supposed to be lubricated with soap, or merely with water; but it is said that distinct traces of lubricating oil were found on the lower head of this tank after the explosion. The use of any true oil for lubricating purposes in connection with the compression of oxygen is always dangerous, and it appears to be highly probable (as we have already said) that this accident was due to the presence of such oil, and to its spontaneous explosive combustion. It also appears to be more than doubtful if the gas was properly tested for purity.

The exploded tank was supposed to be strong enough to require a pressure of 1,000 pounds per square inch to produce rupture,—assuming that the pressure was applied steadily and with gradually increasing intensity. In accordance with well-known mechanical principles, however, a suddenly-applied pressure of materially less magnitude might produce failure. We have no way of knowing what the actual maximum pressure may have been.

This accident, whatever its cause may have been, illustrates the reality and [illegible] of the danger associated with the handling of compressed gases, and demonstrates the need of exercising great care to keep every kind of combustible matter away from compressed oxygen,—whether the combustible material be gaseous, liquid or solid.—Travellers' Standard.

WATER POWER AND LOCATION OF PLANT

The presence of coal has been one of the most important factors determining the industrial expansion of various countries during the past hundred years or so.

This condition is gradually changing through the exhaustion of coal supplies. A recent article by G. H. Ashley, State Geologist of Pennsylvania, emphasizing the necessity of replacing coal by water-power, is particularly significant, coming from one who is well able to judge the situation in this great coal state. His statements are of special interest to Canada in view of the prediction that industrial supremacy will, eventually, pass from coal-depleted regions to areas where large water-powers are available. It is even pointed out that one way of keeping the industries where they are in the United States would be by the importation from Canada of enormous quantities of hydro-electric energy available on the St. Lawrence and at Niagara.

Mr. Ashley holds that: "The industrial East has maintained its supremacy because of cheap fuel and nearness to markets. Because of cheap fuel Pittsburgh can afford to haul iron ore from Minnesota. It does not take a seer nor even a scientist to point out that, if our present increased use of power continues, a generation will see the exhaustion of cheap fuel in the East."

"A review of the field today shows that, in several of the districts, practically all of the thick coal has been mined out, while in others it is possible to count the years to the time when the supply will be gone. It may be argued that, as the cost of coal increases, the manufacturing interests of the East will turn to water power. That argument leads to the question of the adequacy of the water-power of that region to take over the burden now carried by coal."

"In addition to the powers within the boundaries of the northeastern United States, there are large powers to the north in Canada. The St. Lawrence below the international boundary is estimated to have a potential horse-power of nearly 1,500,000, and the provinces of Quebec and Ontario have been estimated to have a maximum of 6,000,000 h.p. each, including that from Niagara and the St. Lawrence. Already 125,000 h.p. is imported into New York from Ontario, and a small amount is imported into New England. If all of the Canadian water powers were developed and Canada would allow the exportation of, say, one-half the power, or 6,000,000 h.p., it is probable that the northeastern corner of the United States could look forward to an ultimate utilization of not less than 10,000,000 to 12,000,000 water horse-power."

It need hardly be pointed out that the benefits accruing to Canada from the exportation of 6,000,000 horsepower would be relatively negligible. One large manufacturing plant using, say, 1,200 h.p., would employ more men than the water-power plants generating 6,000,000 h.p.

A Hobart correspondent in the "Times Trade Supplement," says that the National Portland Cement Company, Maria Island, Tasmania, are sending their own engineer to the United Kingdom and America to select the most modern machinery. The whole of the plant for the first unit is expected to be delivered on the works within the next 12 months. It is stated by the secretary of the company that it is proposed to produce from 30,000 to 50,000 tons of cement per year with the first unit, the ultimate objective being 150,000 tons a year, which would be far in advance of the production of any other company in Australia at the present time.

According to a recent statement on the position of the electrical industry in Germany, the output of the German heavy cable makers for the first half of the current year is only 30 per cent. of that of the corresponding period in 1913, while estimates comparing the second halves of these two years point to a proportion of 25 per cent. only. The output in the lamp industry last year was 70 millions of which 25 per cent. were exported, though before the war the production was much greater, and the export about one-half the total output.

2221. Mining Machinery.—A reliable Johannesburg firm of engineering agents are prepared to consider the South African representation of Canadian engineering plants for machinery of all kinds, engineering specialties, mining machinery and material.

MACHINERY SUPPLIERS

MANUFACTURERS REQUIRING MACHINERY

OBITUARY

The death occurred in Montreal on December 31st of Paul Fitzgerald Brophy, mechanical and electrical engineer, at the Canadian Explosives Ltd.

D. J. Dickson, Sec.-Treas. of the James Wilson & Co., railway and steamship supplies, Montreal, died on New Year's day. Mr. Dickson had been with the company since coming to Montreal forty-five years ago.

Wilfred C. Sly, president, and George K. Fanner, vice-president of the W. W. Sly Foundry Co., Cleveland, were killed by bandits who after the hold-up escaped with the company's pay envelopes containing $4,200. The two men died instantly.

The death took place in Wellesley Hospital, Toronto, suddenly on Sunday of Sir Frank Baillie. He underwent an operation some weeks ago, and apparently was progressing favorably, when complications developed and the end came quickly. The late Sir Frank Baillie was president of Canadian Aeroplanes, a firm that turned out very good machines on short order. He was likewise president of Canadian Cartridge Co., Limited, Hamilton, and president of the Burlington Steel Company, Limited, Hamilton. The Canadian Cartridge Company was organized by him shortly after the commencement of the European war for the purpose of manufacturing cartridge cases for the British Government and, it will be remembered, that in June, 1916, he turned over to the government the sum of $758,248 profits from the manufacture of munitions. He was largely responsible for the organization of the Dominion Steel Foundry Company, Hamilton.

The Dominion Transportation Bldg., Welland, has been purchased by the Fulton Motors, H. O., 59 Yonge street, Toronto. No new building will be done until spring.

The contract for the construction of the drydock at Esquimalt, B.C., has been awarded to P. Lyall & Son. The tender was $4,300,000, which is about two millions less than the government estimate.

FIRMS WANT TO ESTABLISH TRADE RELATIONS WITH CANADA

Information regarding the following lines can be obtained by communicating with this paper and mentioning key numbers.

2462. **Industrial Machinery.**—A British firm in Constantinople with extensive connections desires to receive particulars from Canadian suppliers of industrial machinery with a view to future developments of this trade.

2472. **Iron and Steel, Hardware, Tools, Handles and Canned Goods.**—Two African firms, one in Port Elizabeth and the other in East London, make requests for catalogue of any of the above or kindred lines from Canadian manufacturers prepared for regular deliveries.

2466. **Provisions and Foodstuffs, Machinery, Automobiles, Lumber.**—A firm in Cairo, Egypt, the head of which is a British subject and who claim long experience, are desirous of securing the agency of Canadian manufacturers and shippers, and articles suggested are: Provisions, condensed milk, meats, horses and cattle, salted and smoked fish, canned fruits, tobacco, and flax fibre, also agricultural and labour saving machinery, oil engines, automobiles, and lumber. Full list of articles and proposals on file at the Commercial Intelligence Branch, Dept. of Trade and Commerce, Ottawa.

2458. **Fencing material.**—A Johannesburg firm of importers making a specialty of iron and steel fencing material request correspondence from Canadian manufacturers prepared for regular export.

2459. **Baling Wire.**—A Liverpool firm ask for quotations on baling wire, 9 foot lengths, 14 gauge and looped one end.

2460. **Industrial machinery.**—A British firm in Constantinople desires to get in touch with Canadian exporters of industrial machinery of all kinds.

2461. **Industrial machinery.** — Three large British firms in Constantinople with extensive connections are desirous of receiving particulars from Canadian suppliers of industrial machinery of all kinds with a view to the resumption of normal trade with that centre.

2454. **Gasoline and farm engines.** — A Japanese firm of agricultural implement importers in the Hokkaide is anxious to hear from Canadian manufacturers of gasoline engines. The firm is at present importing from the United States, but would be glad to give preference to Canadian manufacturers. The size most in demand is the 1 3-4 h.p. model with magneto ignition, adaptable either to gasoline or kerosene, but all sizes up to 8 or 10 h.p. are imported. Catalogues and c.i.f. prices are requested immediately.

2455. **Iron, steel and engineering specialties.**—A Canadian business man, who is representing an important Canadian manufacturing enterprise in the United Kingdom, would be glad to undertake a few additional Canadian agencies, more especially anything relating to iron, steel or engineering specialties.

Classified Opportunities

HELP WANTED

SALESMAN I WANT A MAN ABLE TO OR-ganize the sale of a good gasoline engine and other farming implements all over the Dominion of Canada. Give reference, state previous employment and salary. Apply Box 741, Canadian Machinery. (ctfm)

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WANTED RESPONSIBLE ENGINEERING firm want Rose Points and use of patterns or Rose Points and one set of Castings each of Points about 36 x 36 Horizontal Boring Mill and Pipe Bending Machines various sizes. Above wanted for advertiser's own shop and not for [illegible] purposes. State what you can offer and [illegible] C. M. T. Ltd. P.O. Box 1187 Montreal. (c2m)

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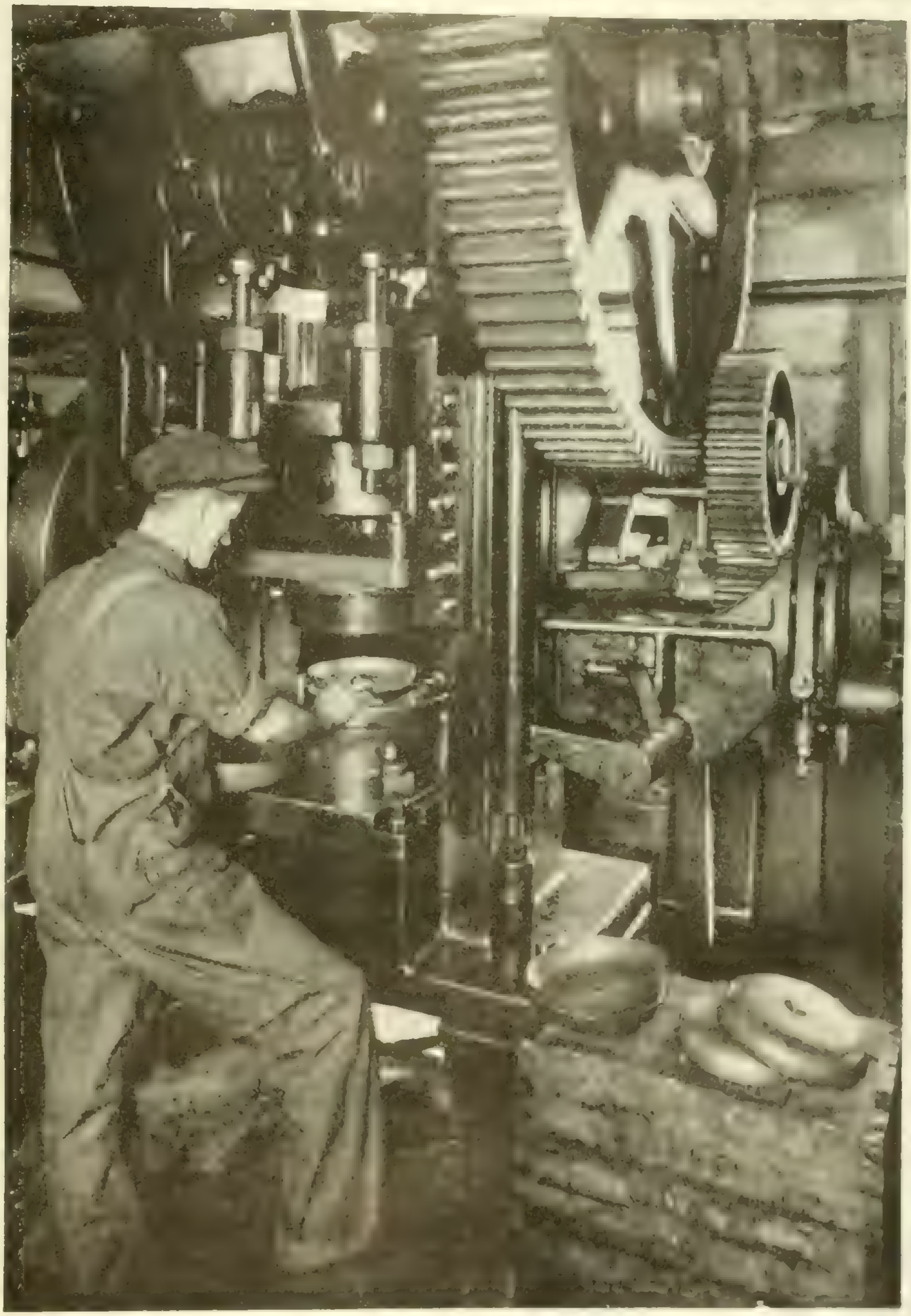

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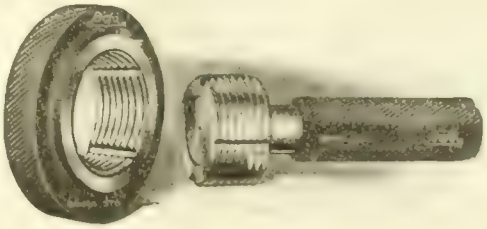

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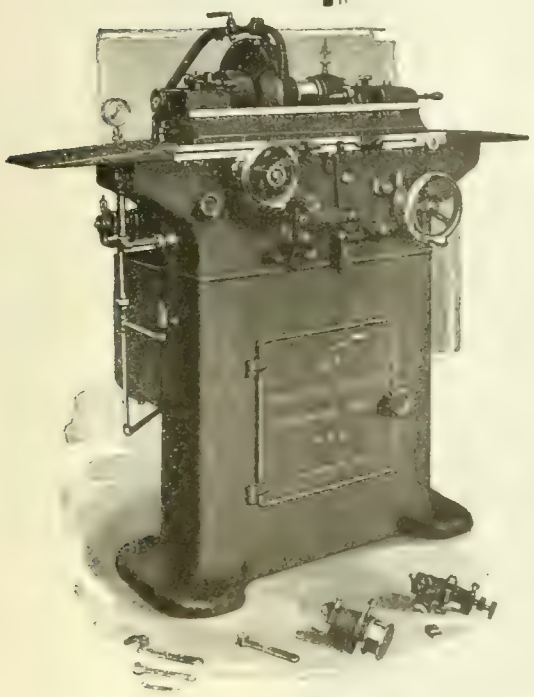

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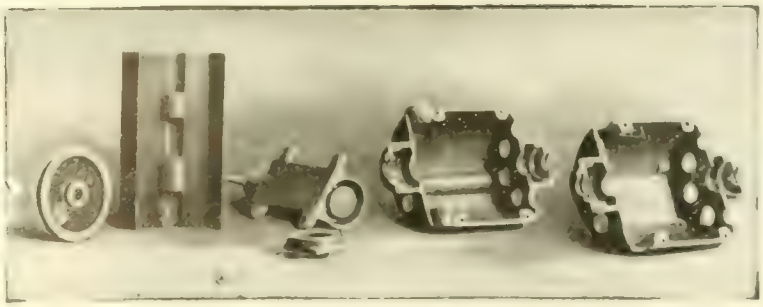

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Bernard Industrial Co., A., Fortierville, Que.

Couplings, Shaft
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

Cranes, Electric
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
[illegible] Montour Falls, N. Y.

Cranes, Hand (See Hoists, Hand)
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

Cranes, Locomotive
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

Cranes, Traveling
[illegible] Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
[illegible]

Crank Pin Turning Machines
[illegible]

Cutters, Flue
Holden Co., Ltd., Montreal, Que.

Cutters, Gear
[illegible]
Pratt & Whitney Co., of Canada, Ltd., [illegible]

Cutters, High Speed
[illegible]
Dundas, Ont.

Cutters, Milling
[illegible]

[illegible]
Elliott & Whitehall Tool Co., Galt, Ont.
[illegible] Ingersoll, Ont.
[illegible]

Cutters, Stay Bolt
[illegible]

Cutters, Thread
[illegible]
Greenfield Tap & Die Corp., Galt, Ont.
[illegible]
Landis Machine Co., Inc., Waynesboro, Pa.

Cutting-Off Machines
[illegible]

Cutting-Off Machines, Pipe (See Pipe Cutting and Threading Machines)
Landis Machine Co., Inc., Waynesboro, Pa.
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Cutting-Off Tools
Armstrong Bros. Tool Co., Chicago, Ill.
[illegible]

Cutting Oil Filters (See Oil Filtering Systems)
[illegible]
Cataract Refining Co., Toronto, Ont.

Cutting, Oxy-Acetylene
[illegible]
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

Dealers, Machinery (See Searchlight Section)
Ford-Smith Machine Co., Hamilton, Ont.
[illegible]

Deckle Straps
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Diamonds, Black and Rough
[illegible]

Diamond, Carbon and Bortz
Joyce-Koebel Co., Inc., New York, N.Y.

Diamond Tools
Aikenhead Hardware Ltd., Toronto, Ont.
[illegible]

Diamond Crossings
[illegible]

Die Sinking Machines, Automatic
[illegible] field, Vt.

Dies, Screw and Thread Cutting
Ackworthie, Ltd., John, Birmingham, Eng.
[illegible] field, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
[illegible]

Dies, Sheet-Metal and Sub-Press (See Tool Work)
[illegible]
Dyrab Steel (Consolidated) Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
[illegible]

Dies, Forging
[illegible] land, Ont.
[illegible] Toronto, Ont.
[illegible]

Dies, Self-Opening, Adjustable
[illegible]
National Acme Co., Cleveland, Ohio.
[illegible] Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

Dies, Threading-Opening
[illegible]

BUYERS' DIRECTORY

Disc Cement

Dividing Heads

Dogs, Lathe and Milling Machine

Drafting Boards and Tables

Drafting Materials

Dressers, Grinding Wheel

Drill Holders

Drill Rods

Drill Speeders

Drilling Machine Heads

Drilling Machines, Automatic

Drilling Machines, Bench

Can. Blower & Forge Co., Ltd., Kitchener.
Henry & Wright Mfg. Co., Hartford, Conn
High Speed Hammer Co., Rochester, N.Y.

Drilling Machines, Electric and Hand

Cincinnati Electrical Tool Co., Cincinnati, Ohio

Drilling Machines, Gang

Drilling Machines, Heavy Duty

Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)

Drilling Machines, Multiple Spindle

Drilling Machines, Pneumatic

Garlock Walker Mchy. Co. Toronto, Ont.
Hooker Co. Ltd. Montreal Que
Independent Pneumatic Tool Co. Chicago Ill

Drilling Machines, Portable

Hooker Co. Ltd. Montreal Que
Independent Pneumatic Tool Co., Chicago Ill
Jardine & Co. A. B. Hespeler, Ont.
Wisconsin Electric Co. Racine Wis

Drilling Machines, Radial

Canada Machinery Corp. Galt, Ont.
Garlock Walker Mchy. Co. Toronto, Ont.
Henry & Wright Mfg. Co. Hartford, Conn
Herbert Ltd., Alfred, Toronto, Ont.
Hooker Co. Ltd. Montreal, Que.
Jardine & Co. A. B. Hespeler, Ont.
Wisconsin Electric Co. Racine, Wis.

Drilling Machines, Sensitive

Can. Blower & Forge Co., Ltd., Kitchener, Ont.
Henry & Wright Mfg. Co. Hartford, Conn
Herbert Ltd., Alfred, Toronto, Ont.
Hooker Co. Ltd. Montreal, Que.
Jardine & Co. A. B. Hespeler, Ont.
Wisconsin Electric Co. Racine, Wis.

Drilling Machines, Turret

Garlock Walker Mchy. Co. Toronto, Ont.
Jardine & Co. A. B. Hespeler, Ont.
Wisconsin Electric Co. Racine, Wis.

Drilling Machines, Vertical

Can. Blower & Forge Co., Ltd., Kitchener, Ont.
Garlock Walker Mchy. Co. Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hooker Co. Ltd. Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Perfect Machine Co., Ltd., Galt, Ont.
Wisconsin Electric Co. Racine, Wis.

Drills, Center

Canada Machinery Corp. Galt, Ont.
Can. Blower & Forge Co. Ltd. Kitchener, Ont.
Garlock Walker Mchy. Co. Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hooker Co. Ltd. Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Perfect Machine Co., Ltd., Galt, Ont.
Wisconsin Electric Co. Racine, Wis.

Drills, High Speed Twist

Ingersoll, Ont.

Drills, Ratchet

Morton Screw & Nut Co., Ltd., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

Drills, Twist and Flat

Can. Detroit Twist Drill Co., Walkerville, Ont.
Morton Screw & Nut Co., Ltd., Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Wire Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Dust Handling Equipment

Can. Blower & Forge Co. Ltd. Kitchener
Sturtevant Co., B. F., Boston, Mass.

Electrical Instruments

Ernst Co., Waterbury, Conn.
Northern Electric Co. Montreal, Que.

Electrical Supplies

Atkins & Co., Inc., E. C., Indianapolis, Ind.
Northern Electric Co. Montreal, Que.
U. S. Electrical Tool Co. Cincinnati, O.

Elevating Trucks (See Trucks)

Elevators and Conveyors

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Hooker Co. Ltd. Montreal, Que.
Morton Screw & Nut Co., Ltd., Ingersoll, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.
Stanley Works, New Britain, Conn.
Stanley Works, The, New Britain, Conn.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Sturtevant Co., B. F., Boston, Mass.
Toronto Elevating Machine Co., Ltd., Toronto, Ont.
Wallace Barnes Co., Bristol, Conn.
Waterous Engine Works Co., St. Paul, Minn.
Wellman Co., The, Cleveland, Ohio.
Wellman-Seaver-Morgan Co., Cleveland, Ohio.
Wickes Boiler Co., Saginaw, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

Emery Cloth

Wallace Abrasives Co., Chicago, Ill.

Emery Wheels (See Grinding Wheels)

Advertising Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, Ind.
Carborundum Co., Niagara Falls, N.Y.
Dominion Abrasive Wheel Co., Ltd., Simcoe, Ont.
Ford Smith Machine Co., Hamilton, Ont.
International Machinery & Supply Co., Montreal, Que.
Norton Co. of Can., Ltd., Hamilton, Ont.

Engines, Capstan

Kennedy & Sons, Wm., Owen Sound, Ont.

Engineers, Mechanical

Ford Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Gear & Machine Co., Toronto, Ont.
Perkins, W. B., San Francisco, Calif.

Expanders, Tube

Garlock Walker Mchy. Co., Toronto, Ont.
Hooker Co. Ltd. Montreal, Que.
Jardine & Co. A. B. Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Eyeglasses, Safety (See Goggles, Safety)

Fibre

Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.

File Handles

Ingersoll File Co., Ltd., Ingersoll, Ont.

Files and Rasps

International Machinery & Supply Co., Montreal, Que.
Morton Screw & Nut Co., Ltd., Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont.
Simonds Saw & Steel Co., Montreal, Que.

Filing Machines

Filler, Iron (See Cements, Iron)

Fire Extinguishers

Montreal, Que.

Fittings, Pipe

Flexible Shafts

Flux, Galvanizing

Fluxes, Welding

L'Air Liquide Society, Toronto, Ont.

Forging Machinery

Acme Machinery Co., Cleveland, Ohio
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio
Stewart & Co., Duncan, Glasgow, Scot.

Forgings, Drop

Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd., Toronto, Ont.

Forgings, Hammer

Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.

Foundry Equipment

Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll Rand Co. Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Hooker Co. Ltd. Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

Foundry Supplies

Atkins & Co., Inc., E. C., Indianapolis, Ind.
Rice Lewis & Son, Ltd., Toronto, Ont.
Stourbridge Co., E. F., Boston, Mass.

Frogs, Spring or Rigid

Can. Steel Foundries, Montreal, Que.

Fuel Oil Burning System

Cole Ltd., George W., Toronto, Ont.
General Combustion Co. of Can., Ltd., Montreal, Que.

Furnaces, Electric

Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.

Furnaces, Heat Treating Coal

General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.

Furnaces, Heat Treating Oil and Gas

Bellevue Industrial Furnace Co., Detroit
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Furnaces and Ovens, Electric

Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Furnaces, Tempering and Annealing

Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Furniture, Machine Shop

Garlock-Walker Mchy. Co., Toronto, Ont.
Ministry of Munitions, London, Eng.
National Engineering Co., Sarnia, Ont.

Gages, Dial

Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

Gages, Measuring (See Tool Work)

Canadian Fairbanks Co., Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Starrett Co., L. S., Athol, Mass.

Gages, Recording

Republic Flow Meters Co., Toronto, Ont.

Gages, Snap, Thread and Cylindrical

Pratt & Whitney Co. of Canada, Ltd., Toronto, Ont.

Gages, Special Measuring (See Tool Work)

Pratt & Whitney Co., of Canada, Ltd., Toronto, Ont.

Gages, Standard

Montreal, Que.

BUYERS' DIRECTORY

Gages, Thread
Ackworthie, Ltd., John, Birmingham, Eng.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

Garnet, Emery and Flint Paper and Cloth
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., [illegible]

Gas, Coal Compressed
L'Air Liquide Society, Toronto, Ont.

Gas, Compressed
Prest-O-Lite Co. of Can., Toronto, Ont.

Gaskets
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Durable Manufacturing Co., [illegible]
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.
Voorhees Rubber Co., [illegible]

Gear Blanks
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

Gear-Cutting Machines
Bertram & Son Co., [illegible], Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whitton Machine Co., D. E., [illegible], Conn.

Gear Testing Machines
Brown & Sharpe Mfg. Co., Providence, R.I.

Gears, Cast
Can. Link Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

Gears, Cut
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.

Gears, Dressed
Kennedy & Sons, Wm., Owen Sound, Ont.

Gears, Forged
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

Gears, Herringbone
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

Gears, Machine Moulded
Can. Steel Foundries, Montreal, Que.

Gears, Rawhide (See Gears, Cut)
Philadelphia Gear Works, Philadelphia, Pa.

Gear, Silent Chain
[illegible]
Morse Chain Co., [illegible], N.Y.

Gears, Worm
[illegible]

Generators, Acetylene
[illegible]

Generators, Electric
[illegible]

Goggles, Safety
[illegible]

Grab Buckets
[illegible]

Grease Cups, Pressed Steel and Brass
[illegible]

Greases, Lubricating
[illegible]

Grinding Discs
[illegible]

Grinding Machines
Brown & Sharpe Mfg. Co., Providence, R.I.

Grinding Machines, Abrasive Belt
Beacon Engineering Co., Tipton, England
Norton Co. of Can., Ltd., Hamilton, Ont.

Grinding Machines, Automatic
Pratt & Whitney Co. of Canada, Ltd., Dundas, Ont.
[illegible]

Grinding Machines, Bench
[illegible]
[illegible] Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
[illegible] Ont.
[illegible] Mass.
[illegible]
Strelinger Co. of Can., Ltd., Chas. A., [illegible]
[illegible]
Williams Machinery & Supply Co., A. R., Montreal, Que.

Grinding Machines, Center
[illegible]

Grinding Machines, Cutter and Reamer
[illegible]
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
[illegible] Dundas, Ont.

Grinding Machines, Cylindrical
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
[illegible] Grand Rapids, Mich.
[illegible] Dundas, Ont.

Grinding Machines, Die
[illegible] Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.

Grinding Machines, Disc
[illegible]

Grinding Machines, Drill
[illegible] Dundas, Ont.
[illegible]

Grinding Machines, Face
[illegible]

Grinding Machines, Floor and Tool
[illegible]

Grinding Machines, Internal
[illegible]
Holden Co., Ltd., Montreal, Que.
[illegible]

Grinding Machines, Portable
[illegible] Que.
[illegible] Ont.
[illegible]

Grinding Machines, Power Oscillating Tool
[illegible]

Grinding Machines, Ring Wheel
[illegible]

Grinding Machines, Snagging

Grinding Machines, Surface
[illegible]

Grinding Machines, Thread
[illegible] Dundas, Ont.

Grinding Machinery, Tool Post
[illegible] Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wilkinson & Kompass, Hamilton, Ont.
Wisconsin Electric Co., Racine, Wis.

Grinding Machines, Universal
[illegible] Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Machine Co., Greenfield, Mass.
[illegible] Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
[illegible] Grand Rapids, Mich.
[illegible]
[illegible] Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelofson Machine & Tool Co., Toronto, Ont.
[illegible] Mass.

Grinding Wheels
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Carborundum Co., Niagara Falls, N.Y.
[illegible] Ont.
Ford-Smith Machine Co., Hamilton, Ont.
International Machinery & Supply Co., Montreal, Que.
Norton Co. of Can., Ltd., Hamilton, Ont.

Guards, Machinery and Window
Can. Wire & Iron Goods Co., Hamilton, Ont.

Gun-Barrel Machinery
Steinle Turret Machine Co., Madison, Wis.

Hack Saws, Power
Ackworthie, Ltd., John, Birmingham, Eng.
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
[illegible]
Goodell & Pratt Co., Greenfield, Mass.
Lyman Tube & Supply Co., Montreal, Que.
McKenzie Machinery Co., Guelph, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
[illegible]
[illegible] Montreal, Que.

Hammers, Chipping
[illegible] Ont.

Hammers, Drop
[illegible] Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

Hammers, Electric
Aikenhead Hardware Ltd., Toronto, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
[illegible]

Hammers, Pneumatic
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que.
[illegible] Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
[illegible]

Hammers, Power
[illegible] Dundas, Ont.
[illegible]
Brown, Boggs & Co., Ltd., Hamilton, Ont.
[illegible]

Hammers, Rivetting
[illegible] Ont.
Ryerson & Son, Jos. T., Chicago, Ill.

Hangers, Shafting
[illegible]
[illegible] & Supply Co., A. R. [illegible]

Hardening, Case Hardening and Tempering
[illegible] Ont.

Hardness Testing Apparatus
[illegible]

Hobbing Machines
[illegible]

Hobs
[illegible]
Greenfield Tap & Die Corp., Galt, Ont.

[illegible] & Whitney Co. of Canada, Ltd., Dundas, Ont.

Hoists, Electric
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que.
[illegible]
Garlock-Walker Mchy. Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Reading Chain & Block Co., Reading, Pa.
[illegible] Niagara Falls, N.Y.
[illegible]

Hoists, Hand
[illegible]
Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio

Hoists, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

Holders-On, Pneumatic
[illegible] Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

Hose, All Kinds
Quaker City Rubber Co., Philadelphia, Pa.

Hose, Flexible
[illegible]

Hose, Industrial
[illegible] Toronto, Ont.
[illegible] Ltd., Toronto, Ont.

Hose, Rubber
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
[illegible]

Hose, Steam, Suction, Water
Quaker City Rubber Co., Philadelphia, Pa.

Hose, Steel
[illegible] Montreal, Que.
[illegible] onto, Ont.

Hospital Supplies
[illegible]
Ingram & Bell, Ltd., Toronto, Ont.

Hydraulic Leather
[illegible] Mass.

Hydraulic Machinery
[illegible] Dundas, Ont.
[illegible]

Igniters, Gas Engine
[illegible]

Indicators, Speed and Test
[illegible]

Jacks, Hydraulic
[illegible]

Jacks, Planer
[illegible]

Jigs and Fixtures (See Tool Work)
[illegible]

Keyseating Machines
[illegible]

Keys, Machine
[illegible]
Morton Mfg. Co., [illegible]

Knives, Machine
[illegible]

Knurl Holders
[illegible] Dundas, Ont.

Lacing Leather
[illegible]

BUYERS' DIRECTORY

Ladders, Permanent
Can. Consolidated Firefoam Co., Hamilton, Ont.

Lamps, Electric
Peterborough Lamp Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

Lathe Attachments
Canada Machinery Corp., Galt, Ont.
Herbert Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Pratt & Whitney Co., of Canada, Ltd., Toronto, Ont.

Lathe Pans, Portable
Canada Machinery Corp., Galt, Ont.

Lathe Tools
Armstrong Bros. Tool Co., Chicago, Ill.
Canada Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Machine Co., Torrington, Conn.

Lathes, Automatic and Semi-Automatic
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

Lathes, Bench
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co. of Canada Ltd., Dundas, Ont.

Lathes, Boring
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)
Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
McKenzie Machinery Co., Guelph, Ont.
Porter-Cable Machine Co., Syracuse, N.Y.
Ryerson & Son, Jos. T., Chicago, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Lathes, Engine
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Cooper & Company, of Galt, Ltd., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Harding Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Ministry of Munitions, London, Eng.
Mueller Machine & Tool Co., Cincinnati, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Perfect Machine Co., Ltd., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Porter-Cable Machine Co., Syracuse, N.Y.
Rockford Lathe & Drill Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Sidney Machine Tool Co., Sidney, Ohio.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Lathes, Extension and Gap
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

Lathes, Heavy Duty Projectile Boring
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blaihill Wire Machy. Co., Ltd., Montreal.
Sidney Machine Tool Co., Sidney, Ohio.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Lathes, Horizontal Turret
Acme Machine Tool Co., Cincinnati, Ohio.
Bardons & Oliver, Cleveland, Ohio.
Brainard Milling Machine Co., Boston, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Lathes, Polishing (See Polishing and Buffing Machines)
Ford-Smith Machine Co., Hamilton, Ont.

Lathes, Relieving
Canada Machinery Corp., Galt, Ont.
Herbert Machine Co., Torrington, Conn.
Strelinger Co., Ltd., R., Galt, Ont.

Lathe, Universal Hand
Brown & Sharpe Mfg. Co., Providence, R.I.

Lathe, Speed and Hand
Garlock Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.

Lathes, Spinning
Terry & Co., John C., Birmingham, Eng.

Lathes, Threading
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

Lathes, Vertical Turret
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Roelefson Machine & Tool Co., Toronto, Ont.

Lathes, Wood Turning
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Lighting Fixtures
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

Linoleum Mill Machinery
Bertram Ltd., Edinburgh, Scotland.

Liquid Air Plants
L'Air Liquide Society, Toronto, Ont.

Lockers, Clothes
Can. Consolidated Firefoam Co., Hamilton, Ont.
Dennes Wire & Iron Works, London, Ont.

Lubricants
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

Lubricating Systems
Bowser & Co., Inc., S. F., Fort Wayne, I.

Machinists' Small Tools
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Goodell & Pratt Co., Greenfield, Mass.
Jones & Shipman, of Leicester, England, Toronto, Ont.
Ker & Goodwin Machine Co., Brantford, Ont.
Ministry of Munitions, London, Eng.
National Machine Tool Co., Racine, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Ryerson & Son, Jos. T., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Manganese Steel
Can. Steel Foundries, Montreal, Que.

Mandrels, Expanding
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Mandrels, Solid
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Measuring Machines
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Metals, Alloy
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Ministry of Munitions, London, Eng.
Moore & Son Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Metalite Cloth
Ritchey Supply Co., Toronto, Ont.

Meters, Steam Flow
Republic Flow Meters Co., Toronto, Ont.

Micrometer Calipers
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

Milling Attachments
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

Milling Machines
Brown & Sharpe Mfg. Co., Providence, R.I.

Milling Machines, Automatic
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

Milling Machines, Bench
Burke Machine Tool Co., Conneaut, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

Milling Machines, Die
Thurston Mfg. Co., Providence, R.I.

Milling Machines, Hand
Burke Machine Tool Co., Conneaut, Ohio.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

Milling Machines, Horizontal and Planer Type
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Lucas Machine Tool Co., Cleveland, Ohio.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

Milling Machines, Plain
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Lucas Machine Tool Co., Cleveland, Ohio
McCroskey Tool Corp., Meadville, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
Toomey Inc., Frank, Philadelphia, Pa.

Milling Machines, Thread
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Milling Machines, Universal
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Lucas Machine Tool Co., Cleveland, Ohio
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Thurston Mfg. Co., Providence, R.I.
Toomey Inc., Frank, Philadelphia, Pa.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Milling Machines, Vertical
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Lucas Machine Tool Co., Cleveland, Ohio
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

Monel Metal
International Nickel Co. of Can., Ltd., Toronto, Ont.

Motors, Electric
Atkins & Co., Inc., E. C., Indianapolis, I.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

Moulded Rubber Goods
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Nickel, Bars, Sheets, Wire, Etc.
International Nickel Co. of Can., Ltd., Toronto, Ont.

Nickel Plating Outfits
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Nickel Silver
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

Nitrogen
L'Air Liquide Society, Toronto, Ont.

Nut Tappers (See Bolt and Nut Machinery)
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

Nuts, Finished and Semi-finished
Galt Machine Screw Co., Galt, Ont.

Nuts, S.A.E., Plain and Castellated
Galt Machine Screw Co., Galt, Ont.

Oil Filtering and Storage Systems
Bowser & Co., Inc., S. F., Fort Wayne, I.

Oil Storage Engineers
Bowser & Co., Inc., S. F., Fort Wayne, I.

Oils
Canadian Oil Companies, Ltd., Toronto, Ont.
Cataract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

Oil Hole Covers
Can. Winkley Co., Ltd., Windsor, Ont.

Oils, Soluble
Cataract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

Oil Stones
Carborundum Co., Niagara Falls, N.Y.

Oxygen
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

Oxy-Acetylene Apparatus
L'Air Liquide Society, Toronto, Ont.

Packing, Hydraulic
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Durabla Manufacturing Co., New York.
Graton & Knight Mfg. Co., Worcester, Mass.
Greene, Tweed & Co., New York City.
Guildford & Sons, Ltd., Halifax, N.S.
Gutta Percha & Rubber, Toronto, Ont.
International Machinery & Supply Co., Montreal, Que.

Packing, Rod and Steam
Durabla Manufacturing Co., New York.
Quaker City Rubber Co., Philadelphia, Pa.

Packing, Steam
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Durabla Manufacturing Co., New York.
Graton & Knight Mfg. Co., Worcester, Mass.
Greene, Tweed & Co., New York City.
Guildford & Sons, Ltd., Halifax, N.S.
Gutta Percha & Rubber, Toronto, Ont.
International Machinery & Supply Co., Montreal, Que.

Paper (Safepack)
Transportation Service Ltd., Toronto, Ont.

Paper Mill Conveyors
Bertrams Ltd., Edinburgh, Scotland.

Patents
Fetherstonhaugh & Co., Ottawa, Ont.
Marion & Marion, Montreal, Que.

Pans, Wet and Dry
Frost Mfg. Co., Chicago, Ill.

Pattern-Shop Machinery (See Woodworking Machinery)
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

Patterns, Wood and Metal
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.

Penstocks, Steel
MacKinnon Steel Co., Sherbrooke, Que.

Phosphor Tin
British Smelting & Refining Co., Ltd., Montreal, Que.

Photographic Duplicating Machines
Commercial Camera Co., Providence, R.I.

Pipe Bending Machines
American Pipe Bending Machine Co., Boston, Mass.
Underwood Corp., H. B., Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

BUYERS' DIRECTORY

Pipe Cutting and Threading Machines
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Pipe and Nipple Threading Machines
Landis Machine Co., Inc., Waynesboro, Pa.

Pipe Fitters' Tools
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

Pipe Threading Die Heads
Landis Machine Co., Inc., Waynesboro, Pa.

Piston-Ring Machines
National Acme Co., Cleveland, Ohio
Steinle Turret Machine Co., Madison, Wis.

Planers, Parallels
L. & P. Mfg. Co., Niagara Falls, Ont.

Planing Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Cowan & Company, of Galt, Ltd., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Toomey Inc., Frank, Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

Planing Machines, Rotary
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

Plate Rolls
Bertram & Son Co., Ltd., The John, Dundas, Ont.

Pneumatic Tools
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
International Machinery & Supply Co., Montreal, Que.
Keller Pneumatic Tool Co., Grand Haven, Mich.

Polishing and Buffing Machines
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

Pressed Steel Parts
Ackworthie, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

Presses, Arbor
Atlas Press Co., Kalamazoo, Mich.
Lucas Machine Tool Co., Cleveland, Ohio
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

Presses, Banding

Presses, Broaching

Presses, Drop and Forging
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Toledo Machine & Tool Co., Toledo, Ohio

Presses, Foot and Hand
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

Presses, Forcing
Atlas Press Co., Kalamazoo, Mich.
Lucas Machine Tool Co., Cleveland, Ohio
Niagara Machine & Tool Works, Buffalo, N.Y.
Stewart & Co., Duncan, Glasgow, Scot.

Presses, Hydraulic
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Niagara Machine & Tool Works, Buffalo, N.Y.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

Presses, Power
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Perry & Wright Mfg. Co., Hartford, Conn.
Lucas Machine Tool Co., Cleveland, Ohio
Niagara Machine & Tool Works, Buffalo, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio

Presses, Screw
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Profiling Machines
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Protractors
Brown & Sharpe Mfg. Co., Providence, R.I.

Propellers
Kennedy & Sons, Wm., Owen Sound, Ont.

Pulleys, Cork Insert
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

Pulleys, Metal
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Canadian SKF Co., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Pulp and Paper Mill Equipment
MacKinnon Steel Co., Sherbrooke, Que.

Pumps, Barrel and Boiler-feed
Trahern Pump Co., Rockford, Ill.

Pumps, Circulating and Coolant
Trahern Pump Co., Rockford, Ill.

Pumps, Geared and Hand
Trahern Pump Co., Rockford, Ill.

Pumps, Industrial
Trahern Pump Co., Rockford, Ill.

Pumps, Hydraulic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

Pumps, Lubricant and Oil
Bowser & Co., Inc., S. F., Fort Wayne, I.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

Pumps, Power
Bowser & Co., Inc., S. F., Fort Wayne, I.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

Punches, Center
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

Punches, Hand
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Jardine & Co., A. B., Hespeler, Ont.
Whitney Mfg. Co., W. A., Rockford, Ill.

Punches, Power
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Toledo Machine & Tool Co., Toledo, Ohio

Punching Machines, Horizontal
Ferranti, Ltd., Edinburgh, Scotland

Pyrometers, Electric
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Williams & Wilson Metal Products Ltd., Hiram, Walkerville, Ont.

Racks, Cut
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

Racks, Storage (See Furniture, Machine Shop)
Rockford Gear & Rack Co., Rockford, Ill.

Rammers, Foundry
Holden Co., Ltd., Montreal, Que.

Reamer Holders
Cleveland Twist Drill Co., Cleveland, O.
Garlock Machine Co., Madison, Wis.
Viking Tool Co., Warren, Pa.

Reamers, Expanding
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co. of Canada, Ltd., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Reamers, Solid
Viking Tool Co., Warren, Pa.
Williams & Wilson Co. of Canada, Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
International Machinery & Supply Co., Montreal, Que.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Reamers, Taper
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Taylor Tool Co., J. A. M., Toronto, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Recorders, Temperature
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Recorders, Time
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

Regulators, Automatic (for electric furnaces)
Volta Mfg. Co., Welland, Ont.

Rheostats
Northern Electric Co., Montreal, Que.

Resistance Materials
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Respirators
Willson Goggles, Inc., Reading, Pa.

Rivets
Parmenter & Bullock Co., Galt, Ont.

Rivet Heaters
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

Rivet-Making Machinery
Acme Machinery Co., Cleveland, Ohio
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio
Ryerson & Son, Jos. T., Chicago, Ill.

Riveting Machines
Baird Machine Co., Bridgeport, Conn.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bullock Co., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Ryerson & Son, Jos. T., Chicago, Ill.
Schuster Co., F. B., New Haven, Conn.

Rolling Mill Equipment
Sendzimir & Co., Duncan, Glasgow, Scot.

Rolls (Rubber Covered)
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Rudder Frames, Steel
Canada Foundries & Forgings, Montreal, Que.

Rubber Goods, Mechanical
Quaker City Rubber Co., Philadelphia, Pa.

Rules, Steel
Chesterman & Co., Ltd., T., Sheffield, Eng.

Rules, Steel and Wood
Brown & Sharpe Mfg. Co., Providence, R.I.

Rust Preventatives
Dearborn Chemical Co., New York, N.Y.

Sand Paper
Norton Abrasives Co., Chicago, Ill.

Sand Equipment
Can. Link-Belt Co., Toronto, Ont.

Sand Mills
Ford Mfg. Co., Chicago, Ill.

Sand Rammers, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

Saw Frames and Blades, Hack
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.

Sawing Machines, Metal
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Ryerson & Son, Jos. T., Chicago, Ill.

Sawing Machines, Power Hack
Ackworthie, Ltd., John, Birmingham, Eng.
Atkins & Co., Inc., E. C., Indianapolis, I.
Levis, The, Toronto, Canada.
Perfect Machine Co., Ltd., Galt, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Saw Sharpening Machines
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

Saw Tables, Universal
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Cowan & Company of Galt, Ltd., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
McKenzie Machinery Co., Guelph, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Saws, Circular Metal
Atkins & Co., Inc., E. C., Indianapolis, I.
Cowan & Company of Galt, Ltd., Galt, Ont.
Simonds Canada Saw Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

Saws, Hand
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.

Saws, Hot and Cold
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.

Saws, High Speed Steel
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

Saws, Metal Band
Atkins & Co., Inc., E. C., Indianapolis, I.
Cowan & Company, of Galt, Ltd., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

Saws, Metal, Power
Clemson Bros., Inc., Hamilton, Ont.

Saws, Metal Cutting
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

Saws, Milling
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Saws, Screw Slotting
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

Saws, Swing Cut-off
Oliver Machinery Co., Grand Rapids, Mich.

Scales
Brown & Sharpe Mfg. Co., Providence, R.I.
Lyman Tube & Supply Co., Montreal, Que.

Screens
Can. Wire & Iron Goods Co., Toronto, Ont.

Screw Driving Machine
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

Screw Extractors
Cleveland Twist Drill Co., Cleveland, O.

Screw Machine Work
Barnes Co., Wallace, Bristol, Conn.
Canada Screw Co., The, Hamilton, Ont.
National Acme Co., Cleveland, Ohio
Taylor-Hall Brass & Metal Co., Hamilton, Ont.

BUYERS' DIRECTORY

Screw Machinery, Wood and Lag
[illegible]

Screw Machines
[illegible]

Screw Machines, Automatic
[illegible]

Screw Machines, Plain or Hand
[illegible]
Herbert Ltd., Alfred, Toronto, Ont.
[illegible]

Screw Plates
[illegible]

Screws, Cap and Set
[illegible]
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[illegible]

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[illegible]

Screws, Safety Set
[illegible]
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Seamless Tubing. (See Tubing, Seamless Steel)
[illegible]

Second-Hand Machinery (See Searchlight Section)
[illegible]

Separators, Moisture and Oil
[illegible]
Que.

Separators, Oil and Waste
[illegible]

Shafting
[illegible]
Can. Drawn Steel Co., Hamilton, Ont.
[illegible]
Montreal, Que.

Shapes, Cold-Drawn Special Steel
Union Drawn Steel Co., Hamilton, Ont.

Shaping Machines
Canada Machinery Corp., Galt, Ont.
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Herbert Ltd., Alfred, Toronto, Ont.
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British Smelting & Refining Co., Ltd., Montreal, Que.

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Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
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National Acme Co., Cleveland, Ohio.

Spectacles, Industrial
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Springs
Barnes Co., Wallace, Bristol, Conn.
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Steele Ltd., James, Guelph, Ont.

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Squares
Brown & Sharpe Mfg. Co., Providence, R.I.

Stamping, Metal
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Elliott & Whitehall Tool Co., Galt, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
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Tallman Brass & Metal Co., Hamilton, Ont.

Stamps, Steel
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Steel Plate
Hamilton Bridge Works Co., Ltd., Hamilton, Ont.
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Steel, Cold-Rolled Strip
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Ontario Metal Products Co., Ltd., Toronto, Ont.

Steel Castings
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Steel, Shafting and Free Cutting Screw
Barnes Co., Wallace, Bristol, Conn.
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Union Drawn Steel Co., Hamilton, Ont.

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Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

Steel, Tanks
Can. John Wood Mfg. Co., Toronto, Ont.

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Jardine & Co., A. B., Hespeler, Ont.
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Victor Tool Co., Waynesboro, Pa.

Teeth, Dredge Bucket
Kennedy & Sons, Wm., Owen Sound, Ont.

Testing Metals and Materials
Toronto Testing Laboratory, Toronto, Ont.

Thermometers
Bristol Co., Waterbury, Conn.

Thread-Cutting Tools
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

Thread Cutting Machines
Landis Machine Co., Inc., Waynesboro, Pa.

Threading Machines
Acme Machinery Co., Cleveland, Ohio.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Thread Lead Testing Machines
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co. of Canada, Ltd., Dundas, Ont.

Thread-Rolling Machines
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Tongs
Hepburn Ltd., John T., Toronto, Ont.

Tool Cases
Rice Lewis & Son, Ltd., Toronto, Ont.

Tool Holders
Armstrong Bros. Tool Co., Chicago, Ill.
Bilton Machine Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

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Canada Machinery Corp., Galt, Ont.
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Tool Steels for all Purposes
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

Tools, Small (See Machinists' Small Tools)
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Dyrab Steel (Consolidated) Ltd., Toronto, Ont.
Elliott & Whitehall Tool Co., Galt, Ont.
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Rapid Tool & Machine Co., Lachine, Que.
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Rockford Milling Machine Co., Rockford, Ill.
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Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

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Can. Hauck Burner Co., Port Hope, Ont.
International Machinery & Supply Co., Montreal, Que.
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Prest-O-Lite Co. of Can., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

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Can. Steel Foundries, Montreal, Que.

Transformers
Northern Electric Co., Montreal, Que.

Transmission Machinery
Bernard Industrial Co., A., Fortierville, Que.
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Garlock-Walker Mchy. Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
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Renold (Hans) of Canada, Ltd., Montreal, Que.

Transportation Systems (See Trucks)
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Treated Bits
Vanadium Alloys Steel, Latrobe, Pa.

Trolleys and Tramways
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Reading Chain & Block Co., Reading, Pa.
Wright Mfg. Co., Lisbon, Ohio.

Trucks
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cowan Truck Co. (R. B. Smiley), Toronto, Ont.
Diamond State Fibre Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Maple Leaf Mfg. Co., Montreal, Que.
Ministry of Munitions, London, Eng.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
National Steel Car Corp., Ltd., Hamilton, Ont.

Trucks, Industrial Motor
Maple Leaf Mfg. Co., Montreal, Que.
Ministry of Munitions, London, Eng.
National Steel Car Corp., Ltd., Hamilton, Ont.

Tube, Products
Tube Co. of Canada, Toronto, Ont.

Tubing, Electric Welded or Oxy-Acetylene Welded
Tube Co. of Canada, Toronto, Ont.

Tubing, Flexible
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

Tubing, Seamless Steel
Tube Co. of Canada, Toronto, Ont.

Tubing, Seamless Steel, Brass and Copper
Dom. Steel Products Co., Brantford, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Tubing, Welded
International Nickel Co. of Can., Ltd., Toronto, Ont.

Tubing, Welded Steel
Tube Co. of Canada, Toronto, Ont.

Turbines, Water
Kennedy & Sons, Wm., Owen Sound, Ont.

Turret Heads
Ackworthie, Ltd. John, Birmingham, Eng.
Bertram & Son Co., Ltd., The John, Dundas, Ont.

Turret Machines (See Lathes, Horizontal Turret)
Acme Machine Tool Co., Cincinnati, Ohio.
Cook Co., Asa S., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Turrets, Tool Post
Gisholt Machine Co., Madison, Wis.
McCroskey Tool Corp., Meadville, Pa.

Unions, Pipe
Crane Ltd., Montreal, Que.

Universal Joints
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

Valves
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Crane Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.
Voorhees Rubber Co., Jersey City, N.J.

Valves, Rubber Pump
Quaker City Rubber Co., Philadelphia, Pa.

Vises, Drilling Machine
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
Reed Mfg. Co., Erie, Pa.

Vises, Metal Workers'
Aikenhead Hardware, Ltd., Toronto, Ont.
Columbia Hdwe. Division, Cleveland, O.

Vises, Milling Machine
Brown & Sharpe Mfg. Co., Providence, R.I.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Reed Mfg. Co., Erie, Pa.

Vises, Pipe
Columbia Hdwe. Division, Cleveland, O.
Greenfeld Tap & Die Corp., Galt, Ont.

Vises, Planer and Shaper
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Reed Mfg. Co., Erie, Pa.
Superior Machine Co., London, Ont.

Vises, Universal Machine
Reed Mfg. Co., Erie, Pa.

Vises, Wood Workers'
Columbia Hdwe. Division, Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Victor Tool Co., Waynesboro, Pa.

Voltmeters
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

Wagon Loaders
Can. Link-Belt Co., Toronto, Ont.

Washers
Barnes Co., Wallace, Bristol, Conn.
Diamond State Fibre Co., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Parmenter & Bulloch Co., Gananoque, Ont.
Voorhees Rubber Co., Jersey City, N.J.

Washers, Rubber
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Welding Apparatus, Oxy-Acetylene
L'Air Liquide Society, Toronto, Ont.

Welding, Electric
Carter Welding Co., Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.

Welding Filler Rods
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

Welding Machines, Oxy-Acetylene
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

Welding, Oxy-Acetylene
All-Weld Co., Toronto, Ont.
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

Welding Supplies
All-Weld Co., Toronto, Ont.
British Smelting & Refining Co., Ltd., Montreal, Que.
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Canada, Ltd., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

Wheels, Industrial
American Pulley Co., Philadelphia, Pa.
Hull Iron & Steel Foundries, Hull, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.

Winches, Electric
Volta Mfg. Co., Welland, Ont.

Winches, Headgate
Kennedy & Sons, Wm., Owen Sound, Ont.

Winches, Stoplog
Kennedy & Sons, Wm., Owen Sound, Ont.

Wire
Anglo-Canadian Wire Co., Montreal, Que.
Barnes Co., Wallace, Bristol, Conn.
Canada Metal Co., Ltd., Toronto, Ont.
Dennis Wire & Iron Works, London, Ont.
Greening Wire Co., B., Hamilton, Ont.
Northern Electric Co., Montreal, Que.

Wire Cloth
Can. Wire & Iron Goods Co., Hamilton, Ont.

Wire Rope
Can. Wire & Iron Goods Co., Hamilton, Ont.

Wire Straightening and Cutting Machinery
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Schuster Co., F. B., New Haven, Conn.

Wire, Welding
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Wires, Special
Anglo-Canadian Wire Co., Montreal, Que.
Dennis Wire & Iron Works, London, Ont.
Greening Wire Co., B., Hamilton, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Woodworking Machinery
Canada Machinery Corp., Galt, Ont.
Cowan & Company, of Galt, Ltd., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

Wrenches, Drop Forged
Armstrong Bros. Tool Co., Chicago, Ill.
Canada Foundries & Forgings Co., Welland, Ont.

Wrenches, Machinists'
Armstrong Bros. Tool Co., Chicago, Ill.
Canada Foundries & Forgings Co., Welland, Ont.

Wrenches, Pipe
Canada Foundries & Forgings Co., Welland, Ont.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.

Wrenches, Tap
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Greenfield Tap & Die Corp., Galt, Ont.

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